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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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77-1172. Heinisch, E. (Author address not given). **Stand und Perspektiven der Verminderung von Umweltbelastungen durch Agrochemikalien.** [**Status and prospects for reducing environmental pollution by agricultural chemicals.**] *Sitzungsber. Akad. Wiss. DDR, Kl. Math. - Naturwissensch. - Techn.* 12: 30-67; 1975. (56 references) (German)

Present status and problems of environmental pollution by farm chemicals in East Germany are discussed. Carbamates, thiocarbamates, triazines, organophosphorus pesticides, dinitro compounds, growth regulant herbicides, copper preparations, lindane, DDT, camphechlor, and chlorate are the major pesticides used currently in East Germany. Dinitro compounds in general and DNOC in particular should be replaced by less toxic and persistent preparations. Water and air pollution by pesticides is in most cases due to the uncontrollable drift of preparations distributed from aircraft. To reduce drift, the particle size spectrum should be 150-300 μ. The use of pesticides in water catchment areas is prohibited. The persistence of certain pesticides, especially of DDT, can be substantially reduced by application in microencapsulated form. The use of pesticides, and consequently the level of environmental pollution can be reduced by the use of biological pest control with attractants, repellants, pheromones, sterilants, and of natural enemies of pests. Certain aquatic plant species may accelerate the degradation of pesticide residues in water.

77-1173. Benz, U.; Cremer, H. D. (Inst. Ernaehrungswiss. I, Justus-Liebig- Universitat Giessen, Giessen, West Germany). **Pathogene Faktoren in Lebensmitteln pflanzlicher Herkunft.** [**Pathogenic factors in plant products.**] *Med. Klin.* 70(43): 1721-1728; 1975. (13 references) (German)

General problems concerning residues of pesticides, food additives, and other substances in foodstuffs of vegetable origin are discussed with special regard to the situation in West Germany. The recent trend in the pesticides industry has been toward the development of preparations with reduced persistence. While DDT can be banned in temperate climates, such a ban could, as it already did, have catastrophic consequences in tropical regions. Most of the classical organochlorine pesticides have already been banned in West Germany, yet they may occur in foodstuffs due to their persistence and in imported goods. Organophosphorus pesticides are degraded very rapidly, ceasing to be a cause for concern. Herbicides are degraded rapidly, and they are of low toxicity for humans. The fungicides used in Germany are metabolized in a few weeks. Pesticide residues in foodstuffs, even if they exceed the tolerance levels, do not represent actual health hazards due to the built-in safety margins of the tolerances and to the very slim chance of long-term exposure to high residue levels.

77-1174. Sevcik, M. (Author address not given). **Problematika akutnych otrav pesticidy v zemedelstvi.** [**The problem of acute pesticide poisoning in agriculture.**] *Prac. Lek.* 28(10): 383; 1976. (Czech)

The current status of pesticide use for plant protection in Czechoslovakia is discussed, followed by an analysis of the major characterictics of certain pesticides and the difficulty in establishing the active substance and its toxicity. Accurate evidence on the occurrence of both occupational and nonoccupational (which occur more often) acute poisonings in Czechoslovakia is lacking. The clinical symptomatology and principles of treatment of poisoning by some of the most commonly used chemicals are discussed. The importance of providing doctors with better information on pesticide preparations is emphasized. (Summary of paper presented at a seminar in Brno, Apr. 15, 1976).

77-1175. Petering, H. G.; Tepper, L. B. (Dep. Environ. Health, Univ. Cincinnati Coll. Med., Cincinnati, OH). **Pharmacology and toxicology of heavy metals:mercury.** *J. Pharmacol. Ther.* A 1(2): 131-151; 1976. (127 references)

Environmental and clinical problems in the use of mercury in industry, in agriculture, and as a drug are reviewed. Aspects covered include chemistry, analytical determination of mercury, biotransformation of mercury, clinical toxicology of mercury, treatment of mercury poisoning, mercury absorption, excretion, and distribution, biological and biochemical effects of mercury compounds, and diuretic action of organic mercurials. The presence of mercury in the environment is a complex phenomenon, partly due to natural occurrence and partly to human activities.

77-1176. Jukes, T. H. (Dep. Med. Phys., Univ. California, Berkeley, CA). **DDT--benefits and risks.** *Trends Biochem. Sci.* 2(2): N38-N39; 1977. (2 references)

Arguments for the consideration of benefits as well as risks of DDT use are presented. Despite a prolonged record of safe use in the public health sphere DDT was virtually banned, as were aldrin, dieldrin, chlordane, and heptachlor. Administrative procedures used in determining the need for these bans are questioned.

77-1177. Dyer, E. B.; Hanrahan, C. E.; Beck, G. H.; Cowan, G. R.; Thurston, H. D. (N.Y. State Coll. Agric. Life Sci., Ithaca, NY). **Potential increases in food supply through research in agriculture. Constraints on increasing agricultural production in the tropics. Research and implementation needs.** *Natl. Tech. Inform. Serv.* PB-257,358, 1976, 57 p.

The report centers on researchable constraints which can be addressed immediately and, with reasonable inputs, be expected to produce production-increasing results in 5-10 yrs. Enhancement of prospects for technological innovation employing a described global network of agricultural research institutions is suggested. Techniques which will foster farmer-researcher systems of the tropics

are called for as a means of increasing food production. Enhancement of efforts in the following areas are recommended: (1) evaluation and utilization of available germplasm in cropping systems, (2) inventory of soil resources and determination of amendments needed to produce adapted plants, (3) improvement of water and pest management practices and seed technology, and (4) utilization of ruminant animals in farming system with attention to feed supplies, protection from diseases and increased productivity of the animals. (Author abstract by permission)

77-1178. Glass, E. H. (N. Y. State Coll. Agric. Life Sci., Ithaca, NY). **Potential increases in food supply through research in agriculture. Research needs on pesticides and related problems for increased food supplies.** *Natl. Tech. Inform. Serv.* PB-257,361, 1976, 70 p.

Pests including insects, disease organisms, nematodes, weeds, rodents and other noxious organisms, are estimated to cause crop losses of more than one-third of the potential production in the United States and even more in the warmer, humid areas of the world. Postharvest losses are also heavy. Prevention of even a portion of such losses would greatly increase available food supplies. A broad attack on pest-control problems is needed through integrated pest management. Pesticides are one of the very important components of most integrated pest systems. Research on pesticides is needed in two broad categories; (1) improved efficiency and effectiveness for existing pesticides, their use and application technology, and (2) the discovery and development of new pesticides and behavior-modifying chemicals. (Author abstract by permission)

77-1179. Pinnock, D. (Calif. State Dep. Transport., Off. Maintenance, Sacramento, CA). **Non-chemical means of pest management in the highways landscape.** *Natl. Tech. Inform. Serv.* PB-257,513, 1976, 54 p.

The research project was directed towards the development of a nonchemical insect pest management program. The management of insect pests in highway landscapes involves the solution of various interacting problems, some in common with agricultural pest management programs and others unique to highway landscapes. The problems in common with agricultural pest management programs include the phenomena of insect pest resurgence following non-selective pesticide applications. This report makes recommendations on the development of pest management involving a minimum of chemical usage or integrated control. Specific recommendations are made for non-chemical means of pest control for the most damaging pests to highway landscapes. The control of Lepidoptera with *Bacillus thuringiensis* is discussed and recommendations on application and rates are given. (Author abstract by permission)

77-1180. Kover, F. D. (Off. Toxic Substances, Environ. Protect. Ag., Washington, DC). **Review of selected literature on ethylene dibromide (EDB).** *Natl. Tech. Inform. Serv.* PB-257,524, 1976, 23 p.

This report discusses dibromoethane's uses, properties, production, environmental aspects, sampling and analysis methodology, emission estimates, biological and toxicological considerations, mutagenic potential, reproductive effects, carcinogenic activity, regulations, and substitutes. (Author abstract by permission)

77-1181. Fairchild, H. E. (Criteria Eval. Div., Environ. Protect. Ag., Washington, DC). **Pesticidal aspects of chlordane and heptachlor in relation to man and the environment. A further reivew, 1972-1975.** *Natl. Tech. Inform. Serv.* PB-258,339, 1976, 93 p.

This report presents an additional review of both chlordane and heptachlor, which is intended to present selected papers appearing in the literature from 1972-1975. The review indicates new and significant literature in the areas of fish, wildlife, distribution in the environment (air, soil, water), residues in crops and food items, and toxicology and epidemiology. The chemistry information for 1972-1975 was published as a part of a 1975 amendment to the 1972 reviews. This review summarizes rather than interprets scientific data studies in the process of updating the earlier reviews of chlordane and heptachlor. It is not intended to correlate data from different sources of present opinions on contradictory findings. The review covers all uses of the pesticides in the United States and should be applicable to future needs in the Agency. The review was researched and prepared by the Criteria and Evaluation Division, Office of Pesticide Programs, EPA. (Author abstract by permission)

77-1182. Arnold, F. T. (Criteria Eval. Div., Environ. Protect. Ag., Washington, DC). **EPA actions to cancel and suspend uses of chlordane and heptachlor as pesticides: economic and social implications. Part 1.** *Natl. Tech. Inform. Serv.* PB-258,338, 1976, 362 p.

This is a composite of economic and social impact studies conducted in relation to the announcements of EPA that it was intended to cancel many of the currently registered pesticidal uses of chlordane and heptachlor (Nov. 18, 1974 Federal Register). On July 29, it was intended to suspend chlordane and heptachlor. This publication is divided into two parts: (1) Economic and Social Impact Analysis of Cancelling Certain Uses of Chlordane and Heptachlor, and (2) Economic Testimony Presented by EPA at Chlordane/Heptachlor Suspension Hearings, September 18-19, 1975. (Author abstract by permission)

77-1183. Environ. Protect. Ag. (Washington, DC). **Summaries of foreign government environmental reports. Number 47.** *Natl. Tech. Inform. Serv.* NTISUB/B/135-76/007, 1976, 48 p.

The U. S. Environmental Protection Agency, under a series of documents exchanged with foreign governments and international organizations, is collecting environmental reports from around the world. In each issue the document summaries are grouped by subject, by category of document, and by country. Subject areas, which reflect EPA programs, include: air, water, noise, solid wastes, pesticides, toxic substances, radiation, and land use. (Author abstract by permission)

77-1184. Kuthan, A. (Dep. Agric. Anal. Monit., Ustredny kontrolny a skusobny ustav, Bratislava, Czechoslovakia). **Rezidua atrazina v polnohospodarskych podach Slovenska.** [**Atrazine residues in agricultural soils of Slovakia.**] *Agrochemia (Bratislava)* 17(1): 20-22; 1977. (9 references) (Slovak)

Soil samples were collected in different regions of Slovakia an average of 5 mo after atrazine had been applied. Samples were subjected to dichloromethane or chloroform extraction, column cleanup and finally gas chromatography using an alkali flame-ionization detector with a sensitivity of 0.02 mg/kg dry soil. The highest residue levels were observed in light soils and the lowest in heavy soils. Penetration to the 15-30 cm layer was about the same for light and medium soils, but clearly lower for heavy soils. Penetration of residues was, in absolute terms, greater when higher doses had been applied, but in terms of the residue fraction found in the individual soil layers, a direct correlation between applied dose and residue level was not always observed. The 15-30 cm layer contained about 25% of the total residues. When atrazine had been applied in the previous year, residue level were higher, and soil tillage evidently facilitated the penetration of undegraded residues to deeper layers. Soils of southern Slovakia showed higher residue levels than those in central and northern Slovakia, which was primarily a result of the lower precipitation levels in the southern region.

77-1185. Berck, B. (Canada Agr. Res. Station, Winnipeg, Manitoba, Canada R3T 2M9). **Accidental contamination by Avadex BW (triallate) herbicide of waxed paper carton material used for milk containers.** *Bull. Environ. Contam. Toxicol.* 17(2): 146-149; 1977. (4 references)

Following the accidental spillage of Avadex BW (triallate) on the floor of a transport truck, the truck flooring was washed with an aqueous detergent solution and subjected to prolonged treatment with live steam. The truck was then used to transport waxed carton material which was to be used for packaging milk at different commercial dairies. The rolls were subsequently found to emit an obnoxious odor, particularly from the ends that had been in contact with the truck floor. Samples of the rolls were extracted and analyzed by electron capture gas chromatography. All test samples showed variable amounts of Avadex, ranging from 0.026 to 3.00 ppm. The highest concentrations were found on the outer portions of the rolls, with lesser amounts on the inner edge and center portions of the second and third layers of the material. The results indicate that the truck floor cleanup procedure did not completely remove or degrade the Avadex that had spilled on the flooring and that the pesticide had migrated upward from the flooring in the vapor phase; steam treatment may have acclerated this process.

77-1186. Wauchope, R. D.; McWhorter, C. G. (USDA-ARS, South. Weed Sci. Lab., Stoneville, MS 38776). **Arsenic residues in soybean seed from simulated MSMA spray drift.** *Bull. Environ. Contam. Toxicol.* 17(2): 165-167; 1977. (9 references)

Sodium methanearsonate (MSMA) was sprayed at rates of 0.11, 0.22, and 0.44 kg/ha on soybeans at four stages of growth (2-4 trifoliate leaves to midbloom). The treatments were replicated three times in 1973 and in 1974. The mature soybeans were analyzed for arsenic residues using arsine generation and flameless atomic absorption. Mature soybean seeds from plants exposed late in the season to even the lowest application rate of MSMA contained signficant arsenic residues (0.9 ppm or greater). However, treatments applied at early growth stages did not result in detectable arsenic residues in the mature seeds. The results suggest that soybeans absorb foliar-applied MSMA efficiently, and that arsenic applied later in the season can accumulate in the seed. Precautions against drift and the following of label restrictions to early season application on cotton should prevent arsenic residues in soybeans, even in cases where drift damage occurs.

77-1187. Estep, C. B.; Menon, G N.; Williams, H. E.; Cole, A. C. (Dep. Drug Metabolism, Abbott Labs., North Chicago, IL). **Chlorinated hydrocarbon insecticide residues in Tennessee honey and beeswax.** *Bull. Environ. Contam. Toxicol.* 17(2): 168-174; 1977. (8 references)

Several samples of commercial grade honey and beeswax collected from different parts of Tennessee during the summer of 1973 were analyzed for chlorinated hydrocarbon insecticide (CHI) residues. A "Modified Mill's Procedure" was used to clean up the samples prior to electron capture gas chromatographic analysis. The presence of CHI residues was confirmed by analysis on three different columns of widely varying polarity. Most of the honey samples contained 0.01-0.30 ppb CHI residues and the beeswax produced during the same season contained several times higher levels (0.21-39.41 ppb). Two samples of honey and one of beeswax contained no CHI. The number of different CHI is a single beeswax sample varied from one to seven. The CHI found in the samples probably originated from the dusting and spraying of crops with insecticides and it appears that certain CHI are present in the environment whether or not they are used in close proximity to the beehives.

77-1188. Mes, J.; Campbell, D. S.; Robinson, R. N.; Davies, D. J. A. (Dep. Natl. Health Welfare, Health Protect. Br., Food Directorate, Tunney's Pasture, Ottawa, Ontario, Canada). **Polychlorinated biphenyl and organochlorine pesticide residues in adipose tissue of Canadians.** *Bull. Environ. Contam. Toxicol.* 17(2): 196-203; 1977. (13 references)

One hundred seventy-two samples of human adipose tissue from various regions in Canada were analyzed for PCB and organochlorine pesticide residues using gas and thin-layer chromatography (GC and TLC). As compared with samples collected in 1969, these samples, which were collected in 1972, contained lower aver-

age concentrations of lindane, dieldrin, *p,p'*-DDE, *p,p'*-DDT, and total DDT, except for heptachlor epoxide. The 1972 survey also revealed the presence of α- and β- BHC, oxychlordane, and *trans*-nonachlor. There were, however, significant regional differences in the levels of oxychlordane and γ-BHC (lindane), and a significant difference in the levels of *trans*-nonachlor was found between the two sexes. The overall residue levels were nonsignificantly lower in females. The levels of *p,p'*-DDE increased significantly with age and the levels of *p,p'*-DDT increased nonsignificantly with age. The results appear to indicate a trend toward decreasing DDT levels in Canada since the restriction of its use in 1969.

77-1189. McClure, V. E.; Lagrange, J. (Natl. Oceanic Atmospheric Admin., Natl. Marine Fisheries Serv., Southwest Fisheries Cent., La Jolla, CA 92037). **Deposition of heavy chlorinated hydrocarbons from the atmosphere.** *Bull. Environ. Contam. Toxicol.* 17(2): 219-224; 1977. (6 references)

A sensitive method for the measurement of deposition fluxes of volatile and aerosol chlorinated hydrocarbons (CHC) is described. Fluxes of CHC ranging from 10 μg to 10 ng/m^2/day for the 54% chlorine PCB mixture were measured at La Jolla, California (average: 0.2 μg/m^2/day) during February, 1972. PCB fluxes were correlated with the component of the wind trajectory in the direction of Los Angeles weighted by the reciprocal of the wind speed. Chlorinated pesticide fluxes (DDT and dieldrin) were correlated with winds from agricultural areas inland from the measuring sites. The results support the hypothesis that the predominant source of aerosol PCB at La Jolla is the Los Angeles metropolitan area.

77-1190. Robbins, A. L.; Nash, D. F.; Comer, S. W. (Regional Pesticide and Chem. Lab., Washington State Health Serv. Div., Wentachee, WA 98801). **A monitoring study of workers in a central Washington orchard.** *Bull. Environ. Contam. Toxicol.* 17(2): 233-240; 1977. (8 references)

Thirty orchard workers in a large, well-managed, central Washington orchard were monitored to determine if measurable to their normal occupational exposure to pesticide residues on the plant surfaces. The urine and blood sampling period and observation period covered the time of maximum exposure of the workers to plant surfaces which had been recently sprayed. Seven of the 30 workers dropped out of the study before the end of the study period, but illness was not a factor in any instance. Plasma values all fell within the normal range and red blood cell values were normal in all but one case. The plasma cholinesterase levels were significantly higher for the full-time agricultural workers than for the workers employed in the orchard for the summer only. Values of red blood cell cholinesterase were nonsignificantly higher in the full-time workers. In general, the results indicate that the orchard workers studied suffered no ill effects due to their occupation.

77-1191. Okamura, J. P.; Sawyer, D. T.; Gunther, F. A. (Univ. California, Riverside, CA 92502). **Solubility of parathion in orange leaf wax.** *Bull. Environ. Contam. Toxicol.* 17(2): 249-252; 1977. (6 references)

The leaf wax was biochemically removed from freshly picked, unsprayed, mature navel orange leaves and the solubility of parathion in the leaf wax was determined using gas-liquid chromatography. The solubility of parathion in the orange leaf wax at 25 C was 0.5 g/g of wax, which is equivalent to approximately a 30% solution. This high solubility and previously demonstrated in-wax-solution stability clearly demonstrate that citrus leaf waxes may be an important factor in citrus picker "reentry safety", i.e., contaminated waxes could represent a possible hazard to pickers.

77-1192. Malissa, H. (Inst. Anal. Chem., Tech. Hochsch., Vienna, Austria). **Az analitikai kemia helyzete a kornyezetvedelemben. [Role of analytical chemistry in environment protection.]** *Kem. Kozl.* 45(1/2): 105-135; 1976. (11 references) (Hungarian)

General ecological problems and the role of analytical chemistry in environmental protection are discussed with special regard to air pollution. The production and sale of aldrin and dieldrin was banned in the USA on August 1, 1974, in view of laboratory findings on their carcinogenic effect after oral administration of dieldrin to rats and mice. However, there is no evidence of their carcinogenic effect in the human organism, in which their metabolism is different from that observed in animals. Dieldrin was found in 99.5% of all surgical and autopsy samples investigated in 1971.

77-1193. Korotkova, O. A. (All-Union Sci. Res. Inst. Chem. Plant Protect. Ag., USSR). **Razlozhenie gerbitsidov - proizvodnykh mocheviny. [Decomposition of herbicidal derivatives of urea.]** *Khim. Sel. Khoz.* 13(5): 390-395; 1975. (36 references) (Russian)

Studies on the migration, degradation and residue dynamics of urea herbicides are reviewed. These herbicides show limited migration in the soil and are of moderate persistence. They tend to remain on the soil surface for a long time, metabolizing to phenylureas, hydroxylated *N,N*-methyl-*N'*-phenylureas, anilines, and nitrobenzenes by photolysis. Urea herbicides are degraded by such soil microorganisms as *Pseudomonas*, *Bacillus sphaericus*, *Rhizopus japonicus*, *Aspergillus*, *Penicillium*, and *Metarrhizium anisopliae*. When used in the recommended doses, urea herbicides have no unfavorable effect on the soil microflora. They accumulate in plants in negligible amounts. They form conjugates with plant substances, and, in contrast to soil, they are not degraded to anilines in plants. These herbicides do not accumulate in animal tissues; they are metabolized by demethylation and demethoxylation as in the soil and plants, and by the hydroxylation of the phenyl ring. Their metabolites are considerably less toxic than the intact compounds. These herbicides have relatively low ichthyotoxicity.

77-1194. Golovkin, G. V.; Volovnik, L. L. (All-Union Sci. Res. Inst. Chem. Plant Protect. Ag., USSR). **Sorbtsiia pestitsidov komponentami pochvy (obzor literatury). [Sorption of pesticides by soil components (literature review).]** *Khim. Sel. Khoz.* 14(9): 48-57; 1976. (75 references) (Russian)

General physicochemical principles of sorption and theoretical and experimental studies on the adsorption of pesticides by soil components are reviewed. The sorption of pesticides by soil components is determined by such factors as humus and other organic substances, soil pH, moisture content, temperature, and the chemical structure of the pesticide. The chemisorption of pesticides by soil sorbents can be due to ion exchange, to protonation on silicate or colloid surface, to protonation in dissolved phase with subsequent sorption by an ion exchange mechanism, and to protonation with dissociated protons from residual water present on the surface or coordinatively bonded with exchange cations. The sorption usually increases with decreasing pH value. Sorption from neutral solutions is due to hydrogen bond formation and to other non-ionic forces. The rate of adsorption decreases and desorption intensifies for most pesticides and sorbents with rising temperature.

77-1195. Klisenko, M. A. (VNIIGINTOKS, USSR). **Fotoliz pestitsidov v okruzhaiushchei srede (analiticheskii obzor). [Photolysis of pesticides in the environment (analytical review).]** *Khim. Sel. Khoz.* 14(9): 57-62; 1976. (33 references) (Russian)

Studies on the photolysis of pesticides (organochlorine and organophosphorus compounds, urea derivatives, carbamates, carboxylic acid amides, phenoxy acids, amines, amidines, and nitrophenols) by sunlight and UV radiation are reviewed. The photolysis products may be more toxic or less toxic than the respective intact compounds.

77-1196. Gryzlova, G. K. (Inst. Farm Chem. Soil Sci., USSR Acad. Sci., Pushchino, USSR). **Fotokhimicheskoe razlozhenie nekotorykh gerbitsidov. [Photochemical degradation of some herbicides.]** *Khim. Sel. Khoz.* 14(9): 62-65; 1976. (8 references) (Russian)

The photolysis of propanid (propanil), 2,4-D, 2M-4C (MCPA), and 3,4-dichloroaniline (3,4-DCA) in water and in the form of wet and dry adsorbed layers was studied in artificial light and in sunlight. Laboratory experiments revealed that the rate of degradation was a function of the radiation dose. Photolysis of 3,4-DCA was observed even in visible light. Under field conditions, 85-90% of 3,4-DCA degraded in 3-5 hr in direct sunlight, while 40-70% of propanid degraded in 4 days. Photolysis was also observed under water, but its intensity diminished with increasing thickness of the water layer. The photolysis was considerably more intense in water with pH 7.8 than in distilled water (pH 5.6). Salts of 3,4-DCA are more stable in light than is free 3,4-DCA.

77-1197. Chubenko, A. P.; Strekozov, B. P. (Inst. Farm Chem. Soil Sci., USSR Acad. Sci., USSR). **Migratsiya yalana v usloviyakh risovykh orositel'nykh sistem r. Kubani. [Migration of molinate in rice paddies in the Kuban River valley.]** *Khim. Sel. Khoz.* 14(9): 69-72; 1976. (14 references) (Russian)

The migration and residue dynamics of yalan (molinate) were studied in rice paddies after application on the soil after sowing. The water from the rice paddies contained yalan even one month after application. Water circulated over the rice paddies for 1-2 months contained 5-7 μg/liter. The yalan concentration in the water discharged through the main collector peaked with 7-10 μg/liter in June to drop sharply to 0.5-1 μg/liter by early August. The highest concentration in the water discharged at the estuary of the Sea of Azov was 5-7 μg/liter in June and July. Yalan was found to contaminate groundwater.

77-1198. Pil'menshtein, I. D. (All-Union Sci. Res. Inst. Chemical Plant Protect. Ag., USSR). **Puti umen'sheniia nereguliruemogo snosa pestitsidov. [Methods of reducing uncontrolled drift of pesticides.]** *Khim. Sel. Khoz.* 14(12): 25-31; 1976. (22 references) (Russian)

The causes and possibility of the abatement of uncontrolled drift of pesticides during their application are reviewed. Reducing the rate of evaporation of the droplets and generating monodisperse sprays of large droplets are the basic possibilities to reduce drift. Low-volume and ultra-low-volume spraying with solutions in high-boiling solvents or with concentrated reverse emulsions helps achieve these goals best. Microgranulated preparations acting through the plant roots are also useful. To reduce the chance of drift, aircraft should be replaced by helicopters, or light-weight aircraft with low flight altitude (1.5-2 m) should be used.

77-1199. Matthey, E. (Eidgenossisches Gesundheitsamt, Abt. Lebensmittelkontrolle, Switzerland). **Die Durchfuehrung der Lebensmittelkontrolle in der Schweiz im Jahre 1975. [Food monitoring in Switzerland, 1975.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 67(3): 271-294; 1976. (German)

The activity of the Department of Food Monitoring of the Swiss Federal Public Health Service in 1975 is reported. National residue tolerances apply to domestic foodstuffs, while imported foods must comply with the tolerances in Codex Alimentarius. No differences were found between health foods and conventional foods concerning the pesticide residue levels. The DNOC residues found in potatoes afrer experimental treatment with this pesticide did not exceed the tolerance of 0.05 ppm.

77-1200. Anonymous. **Mitteilungen aus der Laboratoriumspraxis. (Auszeuge aus den Jahresberichten amtlicher Laboratorien. [Reports from laboratory practice (excerpts from annual reports of official laboratories).]**

Mitt. Geb. Lebensmittelunters. Hyg. 67(3): 323-365; 1976. (German)

Results of systematic food monitoring by different official laboratories in Switzerland are presented. Dieldrin residues of 2-16 ppb were measured in milk due to contaminated forage and to the inappropriate use of this insecticide in buildings. The residue levels decreased after contaminated forage was no longer fed to the animals. Pesticide residues were found in 66% of all fruit samples investigated. The residue levels were over the tolerance in 23% of all samples of lettuce investigated.

77-1201. Blumenthal, A.; Cerny, M. (Zentral-Laboratorium des Migros-Genossenschafts-Bundes (MGB), Zurich, Switzerland). **Organochlor-Pestizidrueckstaende in Tee und Kaffee. [Organochlorine pesticide residues in tea and coffee.]** *Mitt. Geb. Lebensmittelunters. Hyg.* 67(4): 515-520; 1976. (5 references) (German)

Tea leaves, tea infusions, raw and roasted coffee beans, and coffee were analyzed for organochlorine pesticide residues by a gas-chromatographic method using an electron capture detector. The total DDT and total BHC levels were 610 and 140 ppb, respectively, in Darjeeling tea, while Ceylon tea samples contained less than 1 ppb hexachlorobenzene, 15-37 ppb total BHC, up to 13 ppb heptachlor epoxide, up to 1 ppb dieldrin, and 25-50 ppb total DDT. Endrin (10 ppb) was found in one sample. Most herb tea samples contained only DDT (52-620 ppb), BHC (65-570 ppb), hexachlorobenzene (1-30 ppb) and dieldrin (2-22 ppb). Herb tea infusions and tea from instant tea concentrate contained 5-28 ppb hexachlorobenzene and up to 10 ppb total DDT. Raw coffee beans (Arabica+Robusta and Arabica) contained 1.5-35 ppm α-BHC, 0.5-10 ppb lindane, 0.5-1 ppb dieldrin, 0.5-2 ppb DDE, and 0.5-20.5 ppb DDT. Some samples contained endrin (6.0 ppb) and TDE (0.5-1.5 ppb). The residue levels were substantially lower in roasted coffee (α-BHC: 0.5-1.5 ppb; lindane: up to 0.5 ppb; endrin: 2.0 ppb in one sample; DDE: up to 1.0 ppb; TDE: 0.5-2.0 ppb; DDT: up to 2.0 ppb). Conversion of DDT to TDE (DDD) was observed during roasting. The findings indicate that organochlorine pesticide residues in tea and coffee are hygienically insignificant.

77-1202. Conrad, B. (Tierhyg. Inst. Freiburg, Freiburg i. Br., Germany). **Zur Belastung der Vogelwelt der Bundesrepublik mit chlorierten Kohlenwasserstoffen und PCB. [The contamination of birds in the FRG by chlorinated hydrocarbons and PCB.]** *Naturwissenschaften* 64(1): 43-44; 1977. (2 references) (German)

Five hundred fifty-seven eggs from 19 native bird species in different parts of West Germany during 1974 and 1975 were analyzed for organochlorine pesticide and PCB residues by a gas-chromatographic method. None of the eggs was residue-free; hexachlorobenzene (0.10-258 ppm), *p,p'*-DDE (0.33-490 ppm) and PCB (2-847 ppm) were found in all eggs. Heptachlor epoxide (0.006-26.1 ppm) was found in 99.3% of the eggs; heptachlor (0.06-2.8 ppm) in 56%, aldrin (0.05-2.3 ppm) in 47.2%, and dieldrin (0.05-16 ppm) in 43.5%. All residue levels are expressed on a dry weight basis. Highly significant reductions of the eggshell thickness were determined for 5 out of 14 species (sparrow hawk, hawk, peregrine falcon, wood owl, and barn owl); the reduction was not significant for eagle owl and white stork. Highly significant negative correlations were found between the DDE content of the eggs and the eggshell thickness for sparrow hawk, hawk, and barn owl, and between the PCB content and eggshell thickness for sparrow hawk and hawk. The hexachlorobenzene contamination was highest in areas with intense grain growing due to the use of large amounts of seed-dressing agents, while the DDE contamination was highest in fruit, vegetable, and wine-growing areas. The PCB levels were highest in industrial areas. The contamination level was lower for eggs of polyphagous species, but it was remarkably low in eggs of species feeding almost exclusively on mice. The findings indicate that white-tailed eagle, sparrow-hawk, peregrine falcon, eagle owl, and sea-swallow are especially sensitive to environmental contamination.

77-1203. Beitz, H.; Goedicke, H. J. (Inst. Pflanzenschutzforsch. Kleinmachnow - Biol. Zentralanst. Berlin, DDR). **Auswirkungen der Abloesung von DDT-Praeparaten auf den Rueckstandsgehalt von DDT und Lindan in Getreide. [Effects of the replacement of DDT preparations on the residual amounts of DDT and lindane found in grain.]** *Nachrichtenbl. Pflanzenschutzdienst. DDR* 31(1): 17-21; 1977. (15 references) (German)

DDT residues in grain have declined steeply since 1971 due to the gradual replacement of the DDT preparations in the GDR. It is estimated on the basis of the residual quantities of 0.03 and 0.024 ppm DDT found on the average in wheat and rye, respectively, in 1974 that milled grain products are virtually free from residues, i.e., the values are below the zero tolerance of 0.02 mg/kg. Parallel with DDT, the lindane residues were determined as well. In all cases they were below the 0.5 mg/kg tolerance for raw grain. Some 98 per cent of all samples investigated in 1974 and 100 per cent of the samples analyzed in 1975 were even below the 0.1 mg/kg tolerance for ground grain products. In spite of the increasing use of lindane preparations the lindane contamination of grain was found to be declining due to the better quality of plant protection operations performed by the agrochemical centers. The residues found in milled grain products are well below the 0.02 mg/kg zero tolerance, and thus these products are virtually free from residues.

77-1204. Mazorchuk, B. F.; Fedorchenko, V. S.; Dakhnovs'ka V. F. (Vinnits. Med. Inst., Vinnitsa, USSR). **Organizatsiya i provedennya kontrolya za umovami pratsi zhinok, yaki kontaktuyut' z pestitsydami u sadivnytstvi. [Organizing and controlling the working conditions of**

women in contact with pesticides during garden cultivation.] *Pediatr. Akush. Ginekol.* 4: 60-61; 1976. (Ukrainian)

Laboratory studies of the atmosphere in the working area of gardens in the first days after chemical treatment have shown that up to 0.2 mg/m^3 hexachlorocyclohexane (BHC), up to 0.4 mg/m^3 phosphamide (dimethoate), and up to 0.6 mg/m^3 zineb were present. Insufficient organization and control of pesticide use has resulted in cases of acute and chronic poisoning. Tests were conducted on two apple cultivars treated twice with pesticides. On the second, fifth and seventh days after treatment, Rogor (dimethoate) residues in Snihovyi kal'vi apples remained at 0.39-0.41 mg/kg. Residues were decreased by a factor of two on the tenth day and were not detected on the nineteenth. Residue levels were significantly lower in Boiken apples, although they had been treated twice with a 0.2% solution of chlorophos (trichlorfon) (1800 l/ha) and a 0.3% working solution of metaphos (methyl parathion) (1800 l/ha) at the same time. Metaphos was not detectable by the seventh day after treatment, while chlorophos did not disappear until the nineteenth day. In the Snihovyi kal'vi apples, metaphos disappeared by the nineteenth day and chlorophos by the fourteenth. From 3 wk to 1 mo after treatment, pesticide residues were within permissible limits. Although residues disappeared completely at the end of the third week after 0.2-0.3% solutions of the three pesticides were used, the use of 0.6-0.8% solutions prolonged their presence to 1 mo.

77-1205. Polishuk, Z. W.; Ron, M.; Wassermann, M.; Cucos, S.; Wassermann, D.; Lemesch, C. (Hebrew University-Hadassah Med. Sch., Jerusalem, Israel). **Organochlorine compounds in human blood plasma and milk.** *Pestic. Monit. J.* 10(4): 121-129; 1977. (86 references)

Organochlorine insecticides and polychlorinated biphenyls (PCBs) were assessed in human blood plasma and milk collected from Israeli mothers 2-4 days after childbirth during 1975. The concentration of total DDT (Σ DDT) was similar in whole plasma and milk (74 ppb versus 72 ppb) and higher in plasma-extracted lipids than in milk-extracted lipids:15.12 ppm versus 5.77 ppm. Levels of γ-BHC (lindane), dieldrin, and heptachlor epoxide were higher in whole plasma and plasma-extracted lipids than in whole milk and milk-extracted lipids. PCBs had similar concentrations in extracted lipids of plasma and milk but were significantly higher in whole milk than in blood plasma. Higher percentages of organochlorine insecticides and PCBs were excreted in milk from mothers between 20 and 29 than between 30 and 39, although the younger group had lower levels of these compounds in plasma. Overweight women excreted lower quantities of organochlorine pesticides and PCBs than did women of normal weight. (Author abstract by permission)

77-1206. Strassman, S. C.; Kutz, F. W. (Ecol. Monit. Br., Tech. Serv. Div., U.S. Environ. Protect. Ag., Washington, DC 20460). **Insecticide residues in human milk from Arkansas and Mississippi, 1973-1974.** *Pestic. Monit. J.* 10(4): 130-133; 1977. (11 references)

Between September 1973 and February 1974, 57 samples of human milk were collected from women residing in selected areas of Arkansas and Mississippi. Residues of *p,p'*-DDT, *p,p'*-DDE, *p,p'*-TDE, β-BHC, dieldrin, heptachlor epoxide, oxychlordane, and trans-nonachlor were measured by electron-capture gas chromatography; trace amounts of *o,p'*-DDT and polychlorinated biphenyls were also detected. Additional analytical procedures were employed to confirm the presence of specific residues. (Author abstract by permission)

77-1207. Manske, D. D.; Johnson, R. D. (Kansas City Field Office Lab., Food Drug Admin., U.S. Dep. Health Educ. Welfare, Kansas City, MO 64106). **Pesticide and other chemical residues in total diet samples (X).** *Pestic. Monit. J.* 10(4): 134-148; 1977. (19 references)

Since 1964 the Food and Drug Administration Total Diet study has reported residues of pesticides and other chemicals ingested in the diet of a young adult male, statistically the Nation's largest eater. During the tenth year of the study, pesticide residues remained at the relatively low levels previously reported. Thirty market baskets were collected in 30 cities which ranged in population from less than 50,000 to 1,000,000 or more. Averages and ranges of residues are reported from August 1973 through July 1974 by food class. Individual items in the dairy and meat composites in four market baskets were analyzed for pesticides; results are included. Data for lead, cadmium, selenium, mercury, arsenic, and zinc are also included. Results of recovery studies within various classes of residues are also presented. (Author abstract by permission)

77-1208. Klaas, E. E.; Belisle, A. A. (Iowa Coop. Wildl. Res. Unit, Iowa State Univ., Ames, IA). **Organochlorine pesticide and polychlorinated biphenyl residues in selected fauna from a New Jersey salt marsh—1967 vs. 1973.** *Pestic. Monit. J.* 10(4): 149-158; 1977. (27 references)

More than a half million pounds of DDT were applied to control mosquitoes in salt marsh estuaries of Cape May County, New Jersey, from 1946 to 1966. The use of DDT was discontinued in the County after 1966. In 1967, mean concentrations of DDT and metabolites ranged from 0.63 to 9.05 ppm in aquatic fauna, but by 1973 mean residue levels had decreased 84 to 99 percent among nine species. DDE was still present at reduced levels in nearly all samples in 1973, but other DDT isomers had mostly disappeared. Dieldrin was detected only in clapper rails, and residue levels decreased during the period. Mean concentrations of PCB's increased in the clapper rail, remained the same in the fiddler crab and mud snail, and decreased in the sheepshead minnow, mummichog, striped killifish, and salt marsh snail. Small amounts of mirex, toxaphene, *cis*-chlordane (and/or trans-nonachlor), oxychlordane, and HCB were detected in a few specimens. (Author abstract by permission)

77-1209. Woodham, D. W.; Robinson, H. F.; Reeves, R. G.; Bond, C. A.; Richardson, H. (Anim. Plant Health Inspect. Serv., Brownsville, TX). **Monitoring agricultural insecticides in the cooperative cotton pest management program in Arizona, 1971—first-year study.** *Pestic. Monit. J.* 10(4): 159-167; 1977. (6 references)

A county-wide pest management program was initiated in Pinal County, Ariz., in 1971 to improve ecologically, economically, and socially the system for protecting cotton from insect pests. Included in this program was a plan to determine the environmental impact of any resulting pesticide load in the environment. Monitoring studies were developed for the assay of insecticide residues in soil, sediment, water, and biological materials. This report presents results of the first year's study and analytical methodology used to achieve those results. (Author abstract by permission)

77-1210. Arthur, R. D.; Cain, J. D.; Barrentine, B. F. (Dep. Biochem., Mississippi State Univ., Mississippi State, MS 39762). **DDT residues in air in the Mississippi Delta, 1975.** *Pestic. Monit. J.* 10(4): 168; 1977. (1 reference)

In a previous publication the authors reported an 88 percent decrease in ΣDDT (DDT plus metabolites) in air between 1972 and 1974 in the Mississippi Delta. This period was the first two years after the use of DDT was banned in the United States. The present report shows an additional 36 percent decrease in ΣDDT levels in air between 1974 and 1975. Thus in the past three years ΣDDT in air has decreased by 92 percent, a much more rapid decrease than had been expected. (Author abstract by permission)

77-1211. Cerna, E.; Picmanova, B.; Hruska, J.; Kocianova, M.; Dolezalek, J. (Nat. Dairy Inst., Prague, Czechoslovakia). **Chlorovane pesticidy v mlecnych vyrobcich z vychodoceske oblasti. [Chlorinated pesticides in milk products from an eastern Bohemian region.]** *Prum. Potravin* 27(8): 455-457; 1976. (Czech)

A table of the maximum permissible levels of some chlorinated hydrocarbon pesticides (CHP) in milk fat established by different countries, as well as those proposed by FAO/WHO, and a table of limitations on the use of CHP in different countries are presented. Because CHP accumulate in fat, their levels can be expressed in mg/kg fat. In 1974 CHP residues in milk, butter and hard and semihard natural cheese from the eastern Bohemian region of Zamberecek were studied. For comparison, CHP levels were also determined in raw milk samples from the Laktos-Vysocana region as a representative of central Bohemia. After extraction with ethyl ether, ethanol and petroleum ether and column chromatography on florisil, *p,p'*-DDT, *p,p'*-DDE, DDT + DDE, α-BHC, γ-BHC (lindane) and hexachlorobenzene (HCB) were determined by gas chromatography with an electron capture detector. A direct dependence between the CHP content in the fat of end products and that of the milk used as raw material was found, indicating that CHP tolerance values for milk products may also be calculated per kg milk fat. No definite seasonal trend in CHP levels was noted. Gamma-HCH (lindane) exceeded the tolerance level proposed in Czechoslovakia for milk in 3% of cases, while hexachlorobenzene (HCB) exceeded the FAO/WHO tolerance levels in a certain percent of milk, butter and cheese samples. The range of CHP residue levels was similar in the Zamberecek and Laktos-Vysocana regions. Data on southern Bohemia show that CHP residues remained at approximately the same level from 1972 to 1974, suggesting that a similar trend could be expected in the Zamberecek region for the immediate future.

77-1212. Kontek, M.; Paradowski, S.; Pietraszek, Z.; Glogowski, K.; Olek, L. (Cardiol. Clin., Inst. Intern. Med., Acad. Med., Poznan, Poland). **Zawartosc weglowodorow chlorowanych w tkance tluszczowej podskornej w populaci ogolnej mieszkancow woj. poznanskiego. [Chlorinated hydrocarbons in adipose tissue of general population in Poznan province.]** *Pol. Tyg. Lek.* 32(9): 353-355; 1977. (17 references) (Polish)

Adipose tissue specimens were collected from 30 patients (16 men, 14 women, ages 19-70 years) at surgery. All of the patients were residents of Poznan province, and none of them had conditions which could have been expected to alter pesticide metabolism. All samples contained *p,p'*-DDT (mean 2.46 ppm) and *p,p'*-DDE (mean 4.92 ppm). Twenty-four of the samples contained *o,p'*-DDT (mean 0.07 ppm), and 21 contained lindane (mean 0.08 ppm). The mean total DDT concentration was 8.67 ppm.

77-1213. Harper, D. B.; McAnally, R. J. (Dep. Agric. Food Chem., Queen's Univ., Belfast, Ireland). **Seasonal fluctuations in the concentration of BHC residues in butter.** *Pestic. Sci.* 8(1): 35-42; 1977. (19 references)

Marked seasonal changes in the BHC content of butter in Northern Ireland are reported. Levels of alpha-BHC rise to a maximum of between 0.5 and 0.9 mg/kg on a fat basis in January and February, falling to between 0.02 and 0.04 mg/kg in late summer and early autumn. The use of veterinary preparations containing technical BHC for the control of lice infection in the winter months would appear to be responsible for such fluctuations. Maximum BHC contamination of milk in January and February probably arises by direct ingestion or skin absorption of externally applied BHC and subsequent transfer from the bloodstream to the milk fat. A later smaller contamination peak in the April/May period is probably due to mobilization of BHC stored in the body fat of the animals during the first weeks after parturition. (Author abstract by permission)

77-1214. Helweg, A. (State Lab. Soil Crop Res., 2800 Lyngby, Denmark). **Degradation and adsorption of carbendazim and 2-aminobenzimidazole in soil.** *Pestic. Sci.* 8(1): 71-78; 1977. (21 references)

Increasing adsorption of [^{14}C]-labeled carbendazim in soil took place within a few weeks of incubation and was greatest in soil with a high organic matter content. Carbendazim was slowly decomposed in soil, mainly by soil microorganisms. After 250 days of incubation in two unsterilized soils, 13 and 5% respectively of added [^{14}C]-carbendazim was recovered compared with 70 and 50% respectively from sterile soils; 4-8% of added carbendazim was recovered as 2-aminobenzimidazole (2-AB) from both unsterilized and sterile soil. After 270 days' incubation, 33 and 9% of ^{14}C was recovered as $^{14}CO_2$ from soil supplied with [^{14}C]-carbendazim (20 and 100 mg/kg) respectively. Degradation started more rapidly when carbendazim was added to soil preincubated with the fungicide but the degradation rate was very low in all cases, indicating that the compound is a poor microbial energy source and that the degradation is a co-metabolic process. 2-AB was found as a degradation product. It appeared to be unstable in soil, decomposing rapidly after a lag period of about 3 weeks; small amounts remained in the soil for several months, however, presumably adsorbed on soil particles. (Author abstract by permission)

77-1215. Pengilly, R. W. (Unilever Res. Lab., Isleworth, Middlesex, England TW7 5AB). **Problems and limitations in aerosol particle size measurements.** *Pestic. Sci.* 8(1): 79-83; 1977. (33 references)

Methods of determining aerosol particle size fall into three broad categories. In the first the particles are trapped by some medium and then physically examined. In the second the particles enter a probe and are passed to a sensing device. In the third the aerosol is examined without use of a physical sampler or probe. Advantages and difficulties of methods from each category are discussed. No single sizing method can supply all the information necessary to completely describe an aerosol for a given application. Photographic and microscopic techniques should provide much useful information for many pesticide applications, where the size range of interest covers 50 μm or more.

77-1216. Jones, C. D. (Chem. Def. Establ., Porton Down, Salisbury, Wilts., England). **Ion concentration variations at short distances downwind of continuous and quasi-instantaneous point sources.** *Pestic. Sci.* 8(1): 84-95; 1977. (17 references)

An improved experimental technique is described which enables the fine structure of the ion concentration variations downwind of both continuous and instantaneous point sources to be examined. The method, which involves the use of ionized air, permits resolution of features within diffusing clouds of the order of centimeters since the detector response time is about ten milliseconds. The success of the method can be attributed to the fact that the measurements are entirely electrical in nature, thereby eliminating certain defects inherent in most other sensing techniques. However, the method does possess disadvantages and these are critically examined. Experimental results are presented which show clearly the presence of considerable fine structure hitherto suspected, but not quantitively observed, in diffusing plumes, i.e. from continuous sources, and puffs, i.e. from instantaneous sources. The implications of these data are considered briefly. (Author abstract by permission)

77-1217. Johnstone, D. R.; Huntington, K. A. (Cent. Overseas Pest Res., College House, London, England). **Deposition and drift of ULV and VLV insecticide sprays applied to cotton by hand applicator in Northern Nigeria.** *Pestic. Sci.* 8(1): 101-109; 1977. (11 references)

Experiments have been carried out in northern Nigeria to study the deposition and drift of the small spray droplets (70-130 μm v.m.d.), utilized in the application of carbaryl plus an indicating dye, to cotton, at very low volume rates (6-12 liter/ha) using water-based formulations and at ultralow volume rates (3 liter/ha) using waterless formulations. The character of the deposition and extent of drift have been shown to relate to spray droplet size, formulation and a combination of meteorological factors. Practical recommendations have been evolved for very low volume and ultralow volume techniques in which the time of application is restricted to those periods of the day which favor high recovery. (Author abstract by permission)

77-1218. Egan, H.; Weston, R. E. (Lab. Government Chemist, London SE1 9NQ, England). **Pesticide residues: food surveys in the United Kingdom.** *Pestic. Sci.* 8(1): 110-116; 1977. (25 references)

The development of food surveys for levels of pesticide residues, toxic metals and polychlorobiphenyls and related compounds is outlined. The role of the surveys in monitoring the effect on the levels of compounds in specific foods following changes in pesticide usage is explained. Studies over 8 years on levels in the total diet show they are well below the acceptable daily intakes recommended by the Food and Agriculture Organization/World Health Organization for organochlorine and other pesticides. During this period the levels found have in general declined. (Author abstract by permission)

77-1219. Saravanja-Bozanic, V.; Gaeb, S.; Hustert, K.; Korte, F. (Inst. Chem. Tech. Univ. Munich, Freising-Weihenstephan, Germany). **Beitraege zur ekologischen Chemie CXXXIII. Reaktionen von Aldrin, Chlorden and 2,2'-Dichlorbiphenyl mit O(^{3}p). [Contributions to ecological chemistry 133. Reactions of aldrin, chlordene, and 2,2'-dichlorobiphenyl with O(^{3}p).]** *Chemosphere* 6(1): 21-26; 1977. (8 references) (German)

The reactions of aldrin, chlordene, and 2,2'-dichlorobiphenyl with native oxygen obtained from nitrous oxide by UV irradiation were studied. Aldrin formed dieldrin, which converted to photodieldrin in UV light. Chlordene formed mainly chlordene epoxide, small amounts of ketochlordene, and photochlordene in UV light. The reaction of 2,2'-dichlorobiphenyl with native oxygen resulted in 2,2'-dichlorohydroxybiphenyl and chloronitrobiphenyl.

77-1220. Steinwandter, H.; Schluter, H. (Hessische Landwirtschaftl. Versuchsanst., Darmstadt, West Germany). **Beitraege zur Adsorption von Chlorkolenwasserstoffen an Polyaethylen. II. Adsorption von 11 Chlorkohlenwasserstoff-Pestiziden aus der Gasphase.** [**Adsorption of Organochlorines on Polyethylene. II. Adsorption of 11 Organochlorine Pesticides from the Gas Phase.**] *Chemosphere* 6(1): 27-34; 1977. (9 references) (German)

The adsorption of 11 organochlorine pesticides on polyethylene surfaces from the gas phase was studied. The diffusion path from the evaporator to the polyethylene surface was 30 or 10 cm. At 30 cm distance, the recovery rates determined on the polyethylene surface on the 9th day were 5% for *p,p'*-DDT, 20% for *p,p'*-DDD (TDE), 50% for *o,p'*-DDT, 80% for *p,p'*-DDE, and 100% for heptachlor, aldrin, heptachlor epoxide, alpha-chlordane, gamma-chlordane, dieldrin, and endrin. The recovery rates were 100% for pesticides except for *p,p'*-DDT (10%), *p,p'*-DDD (45%), and for *o,p'*-DDT (80%) on the 19th day. When the distance was reduced to 10 cm, the recovery rates were 100% for pesticides except for *o,p'*-DDT (15%), *p,p'*-DDD (25%), and for *o,p'*-DDT (80%) on the 9th day.

77-1221. Kilzer, L.; Weisgerber, I.; Klein, W.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen-Umweltforsch mbH, D-8042 Neuherberg, Germany). **Contributions to ecological chemistry Part 134. Fate of aldrin-^{14}C-derived residues in soil and plant samples during deep-frozen storage for five to seven years.** *Chemosphere* 6(2-3): 93-98; 1977. (8 references)

Information on conversion of pesticide residues over time is necessary in order to perform time-course studies of chemical pollution. Plant and soil samples containing aldrin residues collected in 1969-1971 were packed without drying in polyethylene bags or aluminum foil, then deep frozen until 1976. They were analyzed before and after storage, and the packing materials were also analyzed. The differences between pre- and post-storage data were generally small and were apparently accounted for by random analytical deviations. Aldrin and dieldrin were not adsorbed by the aluminum foil packing, but small amounts were adsorbed by the polyethylene. Adsorption of photodieldrin and hydrophilic metabolites was even lower than the adsorption of the parent compounds, which is understandable in view of their low volatility if it is assumed that adsorption takes place via the gaseous phase. Especially in the case of more volatile compounds, aluminum foil should be preferred as a packing material.

77-1222. Peterson, S. R. (Univ. Wisconsin, Madison, WI). **The oldsquaw: body measurements, food habits, and environmental contaminants.** *Diss. Abstr. Int.* B 37(8): 3698-3699; 1977.

This study was designed to investigate contamination in Oldsquaws from organochlorines, mercury, and ingested lead shot. Birds wintering on Lake Michigan were obtained from commercial fishing gear. Specimens collected in other wintering areas and in the Arctic were obtained by shooting. Animal matter constituted 99 percent of the Oldsquaws' food, primarily *Pontoporeia affinis*. Late-winter declines in body lipids may be related to decreases in food ingested, but premigratory fattening does not appear to be related to additional food ingested. Highest levels of organochlorines were observed in PCB's and DDE. Residues of DDD, DDT, dieldrin, endrin, heptachlor epoxide, and BHC were relatively low. In December on Lake Michigan, significant differences in DDE levels were noted between age and sex classes. These differences were not apparent in the spring. Significant increases in DDE and PCB residues for Oldsquaws were noted on Lake Michigan between December and May. DDE levels in the wing and carcass were highly correlated. Organochlorine residues were relatively low in the food of Oldsquaws on Lake Michigan. Organochlorine residues were much lower in arctic food than in Lake Michigan food. DDE in paired male and female Oldsquaws was highly correlated, as was DDE in hens and their clutches. Residues were highest in Oldsquaws wintering on the Great Lakes and lowest in Oldsquaws from coastal areas of Alaska and Newfoundland. Mercury levels were similar in different age and sex classes collected during the same time period on Lake Michigan. Mercury residues were higher in Oldsquaws collected in Hudson Bay than in those collected on Lake Michigan. Residues in the hen and clutch were positively correlated. Mercury in duckling livers was negatively correlated with the weight of the liver. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 76-25,579).

77-1223. Sundin, R.; Faust, S.; Weeks, R.; Champlin, R. L. (Dep. Civ. Architect. Eng., Wyoming Univ., Laramie, WY). **Introduction to monitoring and surveillance of the environment.** *Natl. Tech. Inform. Serv.* PB-257,298, 1973, 360 p.

This book includes chapters on general considerations (pollution, monitoring and surveillance systems, sampling, data analysis and presentation, fundamentals of electricity, electronics, and instrumentation; the water environment (properties of the water environment, legal and administrative requirements, parameter significance and variation, monitoring, robot surveillance networks, available water data); the air environment (meteorology, parameters of the air environment, variations in time and space, monitoring techniques, surveillance networks), and pesticides (occurrence and detection of organic pesticides in the environment). (Author abstract by permission)

77-1224. Nat. Field Invest. Ctr. (Denver, CO). **An investigation of pesticide pollution in the lower Colorado River Basin, 1973.** *Natl. Tech. Inform. Serv.* PB-257,302, 1973, 47 p.

The Colorado River forms the boundary between Arizona and California from near Needles, California to near Yuma, Arizona. The report is an investigation of the water quality of the lower Colorado River and it concludes that pollution problems were caused by indiscriminate pesticide application practices on irrigated lands in both Arizona and California. (Author abstract by permission)

77-1225. Federal Working Group on Pest Management (Rockville, MD). **Catalog of Federal pesticide monitoring activities in effect July 1973.** *Natl. Tech. Inform. Serv.* PB-257,595, 1975, 450 p.

The Catalog is a computer listing of federal agency monitoring activities derived from the 'Inventory of Federal Pesticide Monitoring Activities in Effect July 1973.' Instructions for completing the Inventory and the Inventory form are found in Appendix A. Residue data obtained from the monitoring activities listed in this catalog frequently appear in the *Pesticides Monitoring* Journal and other similar publications. The Monitoring Panel has defined monitoring as the repeated sampling and analysis of components of the environment to produce reliable estimates of the pesticide levels in the components and the change of these levels in time. Additional criteria for reporting a monitoring activity in this catalog are that examinations for residues be made by or on behalf of a federal agency, and that monitoring has been in effect since July 1, 1973. (Author abstract by permission)

77-1226. Lande, S. S.; Santodonato, J.; Howard, P. H.; Greninger, D.; Christopher, D. H. (Syracuse Res. Corp., NY Cent. Chem. Hazard Assessment, Syracuse, NY). **Investigation of selected potential environmental contaminations: haloalkyl phosphates.** *Natl. Tech. Inform. Serv.* PB-257,910, 1976, 209 p.

This report reviews the potential environmental hazard from the commercial use of haloalkyl phosphates (HAP). Emphasis is placed mostly on the four tris(haloalkyl) phosphates which are used as fire retardants. Data on the two pesticide HAP's, naled and dichlorvos, are used for comparison purposes. The tris-HAP's (1) are produced in significant quantities, (2) have several potential sources of environmental contamination, (3) have an unknown fate in the environment, (4) may act as cholinesterase inhibitors, and (5) are potentially carcinogenic and mutagenic. (Author abstract by permission)

77-1227. Cubit, D. A.; Deichmann, W. B.; MacDonald, W. E. (Res. Teaching Cent. Toxicol., Miami Univ., Coral Gables, FL). **Determination of organochlorine pesticides in the tissue of the black mullet (*Mugil cephalus*) and the silver mullet (*Mugil curema*).** *Natl. Tech. Inform. Serv.* PB-258,023, 1975, 9 p.

Because of the importance of mullet as a Florida food fish, studies were undertaken to determine their extent given to monthly changes in tissue pesticide concentrations. Such changes might occur in response to seasonal agricultural pesticide use and therefore changing concentrations in runoff waters, or by a physiological process inherent to spawning. (Author abstract by permission)

77-1228. Stone, R.; Smallwood, H. A.; Marsh, J. R. (R. Stone Co., Los Angeles, CA). **Treatment effectiveness for the removal of selected contaminants from drinking water.** *Natl. Tech. Inform. Serv.* PB-258,271, 1975, 199 p.

An extensive literature survey was conducted to determine treatment methods for removing antimony, beryllium, cobalt, lithium, molybdenum, nickel, tungsten, vanadium, bisethers, polychlorinated biphenyls, chlorinated hydrocarbon insecticides, and organophosphorus insecticides from drinking water. The processes discussed included ion exchange, reverse osmosis, electrodialysis, distillation, coagulation/precipitation, chemical oxidation, radio-chemical degradation, and adsorption. Treatment efficiencies were determined in terms of influent and effluent concentrations for each applicable treatment method. Process designs, constraints and limitations, operating conditions, and costs were presented for each treatment process discussed. Each process was evaluated as to its availability, applicability, and technical and economic feasibility. The best available and best technically feasible treatment processes were presented for each contaminant. (Author abstract by permission)

77-1229. Olds, K. L. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, MD). **Pesticide monitoring guidelines. Scheduled monitoring (effective 1 April 1976).** *Natl. Tech. Inform. Serv.* AD-029,983, 1976, 29 p.

The necessity of and mechanisms for stratification of environmental sampling are presented. This serves as the major basis for revision of the Department of the Army Pesticide Monitoring Program. The revised program further insures reliable monitoring data to support pesticide and pest management program changes. (Author abstract by permission)

77-1230. Fisher, R. W. (Air Force Environ. Tech. Appl. Ctr., Scott AFB, IL). **Meteorological and gravitational-settling estimates for USAF aerial spray operations.** *Natl. Tech. Inform. Serv.* AD-030,116, 1976, 45 p.

Accurate forecasts of the drift of pesticides sprayed from aircraft are important to prevent accidental overspray and damage to other wildlife. This report presents estimates of centerline ground-level concentrations of pesticides sprayed from an aircraft for specific locations based upon calculations made by a computer line-source model developed at USAFETAC. (Author abstract by permission)

77-1231. Olds, K. L. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, Aberdeen, MD). Monitoring of pesticide disposal practices, Iowa Army Ammunition Plant, Burlington, Iowa 52600, September 74-January 75. *Natl. Tech. Inform. Serv.* AD-030,862, 1976, 18 p.

This is an interim report giving the results of analyses of five samples taken near a pesticide disposal pit. The samples were analyzed for routine pesticides and special analyses were done for the phenoxy herbicides and for monuron and diuron. Analyses showed above normal concentrations of silvex ranging from 4.52 to 18.52 ppm. There were also residues of 2,4-D and 2,4,5-T present in the samples. (Author abstract by permission)

77-1232. Roan, C. C.; Vinopal, J. H. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, MD). **Entomological special study no. 44-019-75/76. Pesticide analysis of surface water samples collected in the Department of the Army pesticide monitoring program, 1 September 1972--31 December 1974.** *Natl. Tech. Inform. Serv.* AD-A030,880, 1975, 25 p.

The report gives pertinent analytical details, specific collection locations, and analytical results of surface water analyses of samples collected from the scheduled component of the Department of the Army Pesticide Monitoring Program during the period of 1 September 1972 thru 31 December 1974. A total of 306 surface water samples collected from 44 military installations were analyzed. Thirteen samples representing five military installations were positive for residues. Four different pesticides, including dieldrin, diazinon, aldrin, and endrin were found in the water samples. Dieldrin was the most prevalent pesticide residue detected in the samples. Discussions regarding the possible origin of the positive pesticide findings noted are also presented. (Author abstract by permission)

See also **77-1180** **77-1181** **77-1238** **77-1252** **77-1269**

77-1233. Orovcanec, M.; Obradovic, D.; Kleut-Jelic, R. (Inst. Maternal Child Health, Novi Sad, Yugoslavia). **Epidemiologija akcidentalnik trovanja u dece. [Epidemiology of accidental poisoning in children.]** *Arh. Hig. Rada Toksikol.* 27(1): 23-29; 1976. (5 references)

The incidence and epidemiology of accidental poisoning in children treated at the Pediatric Hospital in Novi Sad from 1969 to 1973 have been analyzed. A slight increase in the rate of poisoning was noted in comparison to the previous time period. This observation agrees with other literature data. The rate of accidental poisoning ranged from 1.7 to 3.5% of the total cases (average 2.4%). Poisoning was due to drugs in 64.3% of the cases, to alcohol in 14.2%, to oil derivatives and turpentine in 11.6%, and to pesticides and various cleaning chemicals in 4.9% each. The rate was highest in children 3-6 yr of age (51.4%). One third of the poisonings occurred in children under the age of two years. The mortality rate was 1.2%, and 80.6% of the children had not been given first aid prior to admission to the hospital. Most of the children arrived at the hospital within 2 hr after taking the poison.

77-1234. Garattini, S. (Ist. Ric. Farmacol. Mario Negri, Milan 62, Italy). **TCDD poisoning at Seveso.** *Biomedicine* 26(1): 28-29; 1977.

Procedures followed by Italian agencies after the Seveso disaster are discussed. Various medical institutions participated in planning the decontamination of the area and monitoring effects of TCDD exposure in humans and animals. About 4 months after the event no major clinical damage has appeared, although cases of chloracne are occurring in people with no previous dermatological lesions. Animal deaths have occurred. Edible animals have been eliminated from the area, and no fruit or vegetables originating from the most highly contaminated zones may be eaten. The vegetable matter removed is being stored prior to high-temperature incineration. It is planned that about 10 cm of topsoil in the most heavily contaminated zone (about 1 million square meters) should be removed and incinerated, a massive task. Alternative elimination methods are being tested.

77-1235. Farkasdy, J.; Horvath, A.; Meszleri, E. (David Gruby Skin Inst., Hungary). **A Satecid 65 WP, szelektiv herbicid okozota folgalkozasi dermatosisrol. [A study on occupational dermatosis caused by Satecid 65 WP, a selective herbicide.]** *Borgyogy Venerol. Sz.* 52(3): 112-113; 1976. (18 references) (Hungarian)

Several cases of occupational dermatosis were observed in a factory where Satecid 65 WP (propachlor) was manufactured. Clinical investigations as well as epicutaneous and photo-patch tests indicated that skin inflammation was due to the propachlor active ingredient rather than to any of the surfactants or other formulation components. Preventive measures were developed which were able to prevent dermatitis due to propachlor both in the factory and in the field.

77-1236. Ahmed, W. (Univ. California, Davis, CA). **The effectiveness of predators of rice field mosquitoes in relation to pesticide use in rice culture.** *Diss. Abstr. Int.* B 37(9): 430B; 1977.

The effects of mosquito larvicides on various nontarget organisms in the rice field were studied. Most of the larvicides tested had little or no effect on the insects, except chlorpyrifos, which was found to be toxic to two species of insects at larvicidal doses used in mosquito control. The effects of agricultural chemicals on the mosquitofish, *G. affinis* were also studied. Parathion, chlorpyrifos and Ordram (molinate) were found to be moderately toxic to fish. The fish collected from different parts of Northern California showed a high tolerance for methyl parathion. The fish also showed an increased tolerance to parathion over that reported earlier. In the evaluation of stocking rates of the mosquitofish in the rice field for mosquito larva control, stocking rate of 300 fish per acre was found to give desirable control in most of the fields. It was found that the mosquitofish were more effective in reducing *Culex tarsalis* larvae than *Anopheles freeborni*. This may be due to the action of other predatory insects in the rice field in reducing culicine larval populations, which also peak at the same time, supplementing the action of the fish. Analyzing the feeding pattern of fish, the fish showed a preference for anopheline larvae over culicine larvae, when both were present in the environment. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms. Order no. 77-6323).

77-1237. Chambers, J. E.; Yarbrough, J. D. (Mississippi State Univ., Mississippi State, MS 39762). **Variation in hepatic microsomal hydroxylation enzymes in mosquitofish with season and environmental insecticide exposure.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 356; 1977.

Components of the microsomal hydroxylation sequence were measured monthly for 18 months in the livers of 2 populations of mosquitofish, *Gambusia affinis*. One population is highly resistant to certain organochlorine insecticides and is periodically exposed to pesticide contamination. The susceptible population demonstrated a seasonal periodicity in most of the parameters studied, with highest levels in the winter and lowest levels in the summer. Levels in the winter were about 3 to 6 fold higher than levels in the summer. The peaks of levels of cytochrome b5 and P-450 appeared 2-3 months earlier than the activities of NADH-cytochrome *c*, NADH-cytochrome b_5 and NADPH-cytochrome *c* reductases. The levels in the resistant poulation were more constant, with few seasonal fluctuations observed. Total hepatic and microsomal protein did not show seasonal trends. The resistant population demonstrated a more homogeneous response than the susceptible population. Also insecticide contamination does not appear to induce these enzymes in the resistant population. (Author abstract by permission) (Abstract no. 458) (Abstract from the 61st Annual Meeding of the Federation of American Societies for Experimental Biology, Chicago, Illinois, April 1-8, 1977.)

77-1238. Vrochinskii. K. K.; Makovskii. V. N.; Stefanskii. K. S. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pestic., Polym. Plastic Materials. Kiev. USSR). **Vliianie khlororganicheskikh pestitsidov na organizm cheloveka. [Effects of organochlorine pesticides on humans.]** *Gig. Sanit.* 12: 84-86; 1976. (8 references) (Russian)

Studies on the accumulation of organochlorine pesticides in the human body and on possible relationships between their accumulation and certain diseases are reviewed. The DDT and DDE residue levels in human milk may exceed the MAC value established for cow's milk by 6-8 times. High DDT levels were found in adipose tissue in patients with kidney diseases. cachexia. and carcinomas. High DDE levels were found in the blood of premature infants compared with those in full-term infants. High levels of DDT and its metabolites were found in lung cancer patients. High concentrations of β-BHC were detected in patients with liver diseases. leukemia. malignant neoplasms. and subacute myelo-optic neuropathy. The highest levels were found in patients with malignant tumors. while they were lower in patients with kidney diseases than in normal subjects. Accumulation of organochlorine pesticides in tumors were observed. Chlordane. DDT. aldrin. dieldrin. and lindane may modify the metabolism of drugs in the liver.

77-1239. Pilinskaya. M. A. (Inst. Hyg. Toxicol. Pesticides. Polymers and Plastics. Kiev. USSR). **O geneticheskoi opasnosti fungitsida tsineba v proizvodstbennykh usloviyakh. [Genetic hazards of the fungicide zineb during manufacture.]** *Gig. Tr. Prof. Zabol.* 12: 26-29; 1976. (10 references) (Russian)

Cytogenetic examinations were performed on 24 workers occupationally exposed to zineb during production of this compound. A significant increase was seen in the overall frequency of chromosomal aberrations and in major types of damage inflicted on chromosomes in the peripheral blood lymphocytes. The cytogenetic effect is presumed to be only one of the adverse effects of zineb on workers handling this compound. To prevent these adverse effects it is important that the zineb level be kept below the MAC value of 0.5 mg/m^3.

77-1240. Carlson. J. E.; Villaveces. J. W. (Dep. Med., Ventura County Gen. Hosp., Ventura. CA 93003). **Hypersensitivity pneumonitis due to pyrethrum. Report of a case.** *J. Amer. Med. Assoc.* 237(16): 1718-1719; 1977. (6 references)

A case of hypersensitivity due to repeated exposures to a pyrethrum-based insecticide is reported. The patient was hospitalized for fatigue. chest pain. coughing. and shortness of breath. She admitted using about 2 1/2 cans of pyrethrum-based insecticide in her home each week. but denied allergic reactions except for hay fever in May and June. Chest x-ray revealed a coarse. reticular. diffuse. bilateral interstitial pattern that remained unchanged. Lung biopsy showed interstitital fibrosis with eosinophilic infiltration and large aggregates of histiocytic cells. but grew no pathogens on culturing. The patient's symptoms disappeared with only symptomatic treatment. A pulmonary challenge test with the insecticide gave positive results. and a skin test with pyrethrum alone was distinctly positive. with type 1 and 3 hypersensitivity reactions of Gell and Coombs. The patient has remained asymptomatic and has discontinued the use of the insect spray.

77-1241. Beale. M. G.; Shearer. W. T.; Karl. M. M.; Robson. A. M. (Edward Mallinckrodt Dep. Pediat., Washington Univ. Sch. Med., St. Louis. MO 63110). **Long-term effects of dioxin exposure.** *Lancet* 1(8014): 748; 1977. (3 references)

A child with dioxin poisoning due to playing in a contaminated arena in 1971 was followed up in light of the Seveso incident. On admission in 1971 the symptoms were nosebleeds. headaches. diarrhea. hematuria. and painful micturition. Cystography revealed a greatly contracted. edematous bladder. Kidneys appeared normal. The patients symptoms resolved in 3-4 days after hospitalization; hematuria and proteinuria were absent after 1 week. A cystogram 3 months later appeared normal. but cystoscopy revealed numerous punctate hemorrhagic areas in the bladder. The patient was reexamined 5.3 years after the dioxin exposure. She had grown normally in the interim. Physical examination. neurological studies. urine sediment examination. cystography. pyelography. and clinical chemistry studies all gave normal results aside from slight congenital anomalies as noted in previous examinations. The patient's mother and sister. exposed simultaneously but less extensively to dioxin. also had no apparent sequelae.

77-1242. Uges. D. R. A.; Huizinga. T. (Apotheek Academisch Ziekenhuis. Groningen. The Netherlands). **Een vroegtijdige diagnose van thalliumintoxicaties. [Early diagnosis of thallium intoxication.]** *Pharm. Weekbl.* 111(30): 735-737; 1976. (9 references) (Dutch)

A simple method for the early diagnosis of thallium poisoning by rat poison and other thallium-containing substances is described. The microscopic method is based no Widy's observation of a dark pigment band on hair. which is visualized by treatment with 10% sodium hydroxide solution. The band is visible even in poisoning with subtoxic doses.

77-1243. Berka. J.; Zaviacic. L. (Dep. Int. Med., Hodonin. Czechoslovakia). **Nase zkusenosti s diagnostikou a lecenim akutnich otrav pesticidy. [Our experience with the diagnosis and treatment of acute pesticide poisoning.]** *Prac. Lek.* 28(10): 383; 1976. (Czech)

In 1975. 15 cases of organophosphate poisoning (five severe cases. two moderate and eight mild). two of which resulted in death. were treated. Treatment included

hospitalization, monitoring of vital functions, gastric irrigation, atropine (av. dose 209 mg, max. total dose 334 mg, iv) and TMB-4 (obidoxime). Intoxication often developed in one phase, less often in two phases. Laboratory tests showed leukocytosis in 58.3%, increased transaminase and SGPT in 46.5%, metabolic acidosis in 40%, reduced cholinesterase activity in 33%, and hyperglycemia in 26.6%. Of the organophosphorus insecticides, Soldep was most often the cause of poisoning (46.6%), and was the cause of poisoning in 80% of the severe cases. The toxicity of this chemical may be substantially higher than is generally recognized.

77-1244. Slezacek, V.; Zizlavsky, I. (Dep. Int. Med., Znojmo, Czechoslovakia). **Otravy pesticidy v nasi praxi.** [**Pesticide poisoning in our clinical practice.**] *Prac. Lek.* 28(10): 383-384; 1976. (Czech)

In 1975, 45 people were hospitalized for pesticide poisoning, three of them cases of intentional posioning and 43 accidental. Four patients died. Two accidental swallows of Gramoxone (paraquat) resulted in liver dystrophy, cholestasis, steatosis, toxic nephrosis, myocardial fragmentation, pulmonary hemorrhagic edema, diffuse hyperemia of the brain and death after five days in one patient. In another case, a young girl intentionally took 2 dl of araphosphothion, which led to respiratory and circulatory arrest twice and to clinical death. After intensive resuscitation and temporary improvement, the patient died on the third day. She had also been given 320 mg atropine. A woman who intentionally took 1 dl of intrathion (thiometon), resulting in typical symptoms and deep unconsciousness, recovered after 264 mg atropine and 11 days of hospitalization.

77-1245. Klaff, L. J.; Levin, P. J.; Potgieter, P. D.; Losman, L. G.; Nochomovits, L. E.; Ferguson, A. D. (Respiratory Clinic, Groote Schuur Hospital, Cape Town, South Africa. **Treatment of paraquat poisoning with the membrane oxygenator.** *S. A. Med. J.* 51(7): 203-205; 1977. (12 references)

A 13-year old boy who lived on a fruit farm was ill for a few days with sore throat and vomiting, and remained unwell and listless thereafter. Two weeks later he became short of breath, and was eventually hospitalized with increasing dyspnea, malaise, and mild fever. He failed to respond to antibiotic treatment and deined contact with any known alveolitis-producing agent. Lung biopsy revealed diffuse interstitial fibrosis. Corticosteroid and oxygen treatment were started. The rapid deterioration with oxygen treatment suggested paraquat poisoning, and a friend recalled that the boy had swallowed one mouthful of paraquat solution stored in a soft drink bottle. Cyclophosphamide and membrane oxygenation treatment were initiated, but severe brain damage had occurred at an unknown time and the patient died. Brain damage might have occurred during transfer within the hospital.

77-1246. Luzhnikov, E. A.; Ananchenko, V. G.; Bokarev, I. N.; Akhtomova, L. V.; Bochkarnikova, O. V.; Vysochina, L. G. (Republican Therapy Center for Acute Poisonings of N. V. Sklifosovskii Moscow Scientific Research Institute, Moscow, USSR). **Znachenie gemostaza v razvitii i lechenii pnevmonii u bol'nykh s ostrymi otravleniiami.** [**Hemostasis in connection with development and treatment of pneumonia in patients with acute poisoning.**] *Sov. Med.* (9): 146-148; 1976. (Russian)

Hemostasis was studied in 261 patients with acute poisonings by acetic acid, barbiturates, and organophosphorus pesticides. The reduction of the fibrinolysis observed during the first day of serious poisonings by organophosphorus pesticides was followed by an increase during the next 4-6 days. The findings indicate the development of disseminated intravascular coagulation as a result of toxic shock, acidosis, and deranged microcirculation. In view of the high incidence of pneumonia in such acute poisoning, it is concluded that disseminated intravascular coagulation plays a role in the etiology of pneumonia. This conclusion prompted a therapeutic trial with heparin in the complex treatment of 63 patients, 23 of whom were poisoned with acetic acid, and 20 each with barbiturates and organophosphorus pesticides. The patients received 4 x 15,000-20,000 U of heparin daily for 4-5 days during the acute period of the poisoning. Adjuvant therapy with heparin reduced the incidence of pneumonia to 4.5% vs 40% in the control not treated with heparin. In the heparin-treated group, pneumonia was milder than in the control, and it occurred only among patients poisoned with barbiturates.

77-1247. Luzhnikov, E. A.; Shimanko, I. I. (N. V. Sklifosovskii Sci. Res. Inst. Emergency Aid, Moscow, USSR). **Ostraia pochechnaia nedostatochnost' toksicheskoi etiologii.** [**Acute renal insufficiency of toxic etiology.**] *Terapevt. Arkh.* 48(8): 135-140; 1976. (5 references) (Russian)

The pathogenic mechanisms and therapeutic possibilities in acute renal insufficiency were studied in 345 cases of poisoning, including two cases of poisoning by thiophos (parathion). Toxic acute renal insufficiency may be specific, due to the direct effect of nephrotoxic chemicals and endogenous substances, or nonspecific, due to derangement of the general and regional circulation and of homeostasis in response to the chemical trauma. Acute renal insufficiency is often associated with hepatic lesions. During the initial phase of acute renal insufficiency, rapid elimination of the poison, nonspecific symptomatological therapy, and specific antidote therapy are necessary.

77-1248. Luzhnikov, E. A.; Savina, A. S. (Republ. Ther. Cent. Acute Poisonings, N. V. Sklifosovskii Inst. Emergency Aid, Moscow, USSR). **Miokardiopatii pro ostrykh otravleniiakh.** [**Myocardiopathy in acute poisoning.**] *Terapevt. Arkh.* 48(9): 84-88; 1976. (20 references) (Russian)

Myocardiopathy developing against the background of acute poisoning may be primary, i.e., due to cardiotoxic poisons, or nonspecific or secondary, due to toxic dystrophy. Slowdown of atrioventricular conduction, intraventricular blockade, highly pronounced bradycardia, polytopic ventricular extrasystole with transition to ventricular fibrillation, and cardiac arrest (sometimes repeated) were observed in acute poisoning with organophosphorus insecticides and other chemicals. Significantly reduced plasma sodium and potassium levels and increased potassium and lowered sodium levels in the erythrocytes were observed in patients with serious cardiac arrhythmia due to poisoning by organophosphorus insecticides. Intraventricular blockade in the late period of acute poisoning with organophosphates against the background of pronounced hypoxic changes is a prognostically unfavorable sign. A correlation was established between the seriousness of poisoning by organophosphorus insecticides and the pathological increase in the systolic index.

77-1249. Odegaard, S.; Torjusen, R. (Drammen Sykehus, Medisinsk Avd., Drammen, Norway). **Forgiftning med kolinesterasehemmende plantevernmidler. [Poisoning by anticholinesterase pesticides.]** *Tidsskr. Nor. Laegeforen.* 96(17-18): 1000-1001; 1976. (4 references) (Norwegian)

In 1974 16 tons of organophosphate insecticides were used in Norway. Four cases of organophosphate poisoning were seen in the authors' hospital in the past 10 yr; two were accidental and two were suicidal. One was due to parathion and three to demeton-*S*-methyl (metasystox). One of the suicide victims died due to delay in initiating treatment. The other was a 50-year-old farmer who drank a glass of Metasystox insecticide during an episode of depression. He was hospitalized 1-2 hr later with unreactive pupils, muscle fasciculations, bradycardia, perspiration, and difficult respiration. A total of 8 mg atropine was given within the first hour. Pralidoxime was given i.m. and tracheal aspiration was performed. A total of 24 mg atropine was given over the three-day period of treatment and observation. He was referred for psychiatric treatment after recovery.

77-1250. Zavanella, T. (Ist. Zool., Univ. Milan, Milan, Italy). **Epidemiolgia del melanoma del tritone crestato. [Epidemiology of melanoma in the crested newt.]** *Tumori* 61(1): 123; 1975. (Italian)

Observations were made on about 900 crested newts captured in agricultural areas near Perugia and Milan, near irrigation canals where pollution was relatively slight. Melanoma was observed in 4 of the 493 newts from Perugia and in 12 of the 416 newts from the Rosate area near Milan. Possible causes for the differences in frequency of melanoma included different genetic predispositions to melanoma in the two populations as well as chemical, physical, or viral factors in the environment. The level of pesticide use in Lombardy is 10 times greater than in Umbria: two million kg of organochlorine insecticides were used in Lombardy from Aug. 1, 1967 to July 31, 1968, compared to less than 200,000 kg in Umbria.

77-1251. Bikbulatova, L. I.; Gvozdev, N. P. (Bashkir Med. Inst., USSR). **Professional'nye dermatozy v proizvodstve novogo pestitsida - azotoksa. [Occupational dermatosis due to the new pesticide azotox.]** *Vestn. Dermatol. Venerol.* (6): 68-69; 1976. (3 references) (Russian)

Occupational dermatosis and other poisoning symptoms were studied in 5 laboratory technicians aged 28-41 yr who were engaged in azotox (milbex, CPAS plus BCPE) synthesis for 10-14 days. They had been exposed to chemicals for 8-10 yr. Headache, nausea, fatigability, diffuse erythema of the skin with papulous, vesicular and bullous rash, pruritus, and burning sensation were the symptoms of contact with the acaricide. The skin areas affected were larger than those exposed directly to azotox. Persistent red dermatographia, hyperhydrosis of the limbs, and acrocyanosis, all characteristic of vegetative dysfunction, were seen. All patients proved to be allergic to *p*-chlorothiophenol and 4-chlorophenyl- 2,4,5-trichlorophenyl azosulfide. The findings indicate an allergenic effect of the components of Milbex.

77-1252. Fairchild, H. E. (Criteria Eval. Div., Environ. Protect. Ag., Washington, DC). **Heptachlor in relation to man and the environment.** *Natl. Tech. Inform. Serv.* PB-257,244, 1976, 73 p.

This review evaluates scientific data in the areas of fish, wildlife, distribution in the environment (air, soil, water), residues in crops and food items, and toxicology and epidemiology. This review summarzies rather than interpretes scientific data studied during the process of reviewing heptachlor. (Author abstract by permission)

77-1253. Office of Pesticide Programs (Environ. Protect. Ag., Washington, DC). **Proceedings of the National Symposium on pesticide Labeling (first), Held on June 3-4, 1974, Part I. Presentations, Part II. Questions and answers.** *Natl. Tech. Inform. Serv.* PB-257,301, 1972, 140 p.

Topics covered include: pesticide labeling-a regulatory perspective; labeling requirements-enforcement; labeling requirements-functional; Regulatory requirements-state; labeling problems-federal; labeling problems-state; labeling problems-private industry; labeling problems-user group; labeling problems-environmental view; labeling-marketing communication view; improving label communications; and improving label reading via motivation.

77-1254. Office of Solid Waste Management Programs (Environ. Protect. Ag., Washington, DC). **Report to Congress on disposal of hazardous wastes.** *Natl. Tech. Inform.*

Serv. PB-257,637, 1974, 119 p.

Section 212 of the Solid Waste Disposal act (P.L. 89-272) as amended required that the U.S. Environmental Protection Agency (EPA) undertake a comprehesive investigation of the storage and disposal of hazardous wastes. This document represents EPA's Report to the President and the Congress summarizing the Agency's investigations and recommendations in response to the congressional mandate. The findings are based on the number of contractual efforts and analyses by Agency staff carried out since the passage of the Resources Recovery Act of 1970. The report is organized into a summary, five major sections, and appendixes. The first section discusses the congressional mandate and the Agency's response to it. Next, the public health, technological, and economic aspects of the problems of disposing of hazardous wastes are reviewed. A section detailing the case for hazardous waste regulation follows. The report concludes with a discussion of implementation issues and a presentation of findings and recommendations. (Author abstract by permission)

77-1255. Dep. Agric. Extension Serv., (Washington, DC). **Apply pesticides correctly. A guide for private applicators.** *Natl. Tech. Inform. Serv.* PB-257,724, 1975, 27 p.

Topics covered included pests; pest control; pesticide; labels and labeling; Using pesticides safely; application equipment; and laws and regulations. Color illustrations reproduced in black and white. (Author abstract by permission)

77-1256. Dep. Agric. Extention Serv., (Washington, DC). **Apply pesticides correctly. A guide for commercial applicators.** *Natl. Tech. Inform. Serv.*, PB-257-732, 1975, 41 p.

The guide in this report will describe the most common features of pests, how they develop, and the kinds of damage they do; methods that can be used to control pests and how to combine these methods for the best results; how pesticides work; how pesticide labels can help; how to use pesticides so they will not harm the applicator or the environment; how to choose, use, and care for equipment; and the Federal laws that apply to the things the commercial applicator does on the job. (Author abstract by permission)

77-1257. Office on Monitoring Systems (Environ. Protect. Ag., Washington, DC). **Digest of EPA's monitoring-related satutory authority.** *Natl. Tech. Inform. Serv.* PB-257,760; 1974, 70 p.

The purpose of this document is to help identify the U.S. Environmental Protection Agency's (EPA) environmental monitoring requirements as dictated by legislation. The document will also serve as a reference to all environmental monitoring-related sections of the laws for which the Agency has implementation responsibility. (Author abstract by permission)

77-1258. Monitoring and Data Support Div. (Environ. Protect. Ag., Washington, DC). **Fish kills caused by pollution in 1973.** *Natl. Tech. Inform. Serv.* PB-257,965, 1973, 29 p.

The annual reported fish kill represents the combined data-gathering efforts of private individuals; state fish and game, health, and conservation officers; and water pollution control officials at the state and Federal levels. Usually, a fish kill is first noticed by a fisherman, camper, or other private citizen, who informs a warden or other state official. It is essential that a fish kill be reported and investigated immediately in order to determine the source of pollution and the polluting agent. Dead fish may be washed downstream from the source of pollution. The reporting system depends, to a large extent, upon individuals in the field making state officials aware of fish kills. (Author absract by permission)

77-1259. Johnson, D. E.; Adams, L. M.; Miller, J. D. (Southwest Res. Inst., San Antonio, TX). **Sensory chemical pesticide warning system. Experimental. Summary and recommendations.** *Natl. Tech. Inform. Serv.* PB-258,253, 1976, 99 p.

The main purpose of this program was to develop a warning system which would alert individuals against premature reentry into areas treated with organophosphate and carbamate pesticides. The design of the study was such that the disappearance times of the pesticides and odor agents (as well as visual agents) were determined under laboratory climatic conditions and for at least two different temperatures outdoors. The tests were designed to evaluate different sensory agents rather than to test one with varying climatic conditions. The three insecticides involved in this program were methyl parathion, carbofuran, and azinphosmethyl. The first quarter of the program was devoted to literature searching and generating experimental approaches. Second, third and fourth quarters were almost exclusively devoted to experimental work, although some literature searching and studying were required throughout the program for the purposes of guidance and evaluation. (Author abstract by permission)

See also **77-1174** **77-1180** **77-1181** **77-1182** **77-1191** **77-1211** **77-1228** **77-1231** **77-1353**

77-1260. Knight, H. D.; Reina-Guerra, M. (Dep. Med., Sch. Vet. Med., Univ. California, Davis, CA). **Intoxication of cattle with sodium bromide-contaminated feed.** *Am. J. Vet. Res.* 38(3): 407-409; 1977. (4 references)

Five concentrations of bromide ion, as sodium bromide were incorporated into a pelleted ration and fed to 5 groups of cattle for 49 days. Another group of cattle was fed volunteer oat hay cut from a field that had been fumigated with methyl bromide. On analysis, the hay contained between 6,800 and 8,400 parts per million of bromide ion. Groups fed the pelleted ration containing the highest concentration of bromide and those eating the contaminated hay developed signs of motor incoordination between the 10th and 12th days. The sign of incoordination correlated with serum bromide concentrations of 30 mEq/L or more. Serum bromide concentrations and associated neurologic signs subsided markedly 14 days after feeding of the toxic feeds was discontinued.

77-1261. Pelissier, M. A.; Atteba, S.; Manchon, P.; Albrecht, R. (Lab. Rech. Biol. ISTA, 75141 Paris Cedex 03, France). **Diminution d'activite des oxygenases microsomales du foie chez le rat nourri avec un regime additionne de zinebe. [Decreases in hepatic microsomal oxygenase activity in the rats given zineb in the diet.]** *Ann. Nutr. Aliment.* 30: 45-54; 1976. (12 references) (French)

Young Wistar CF male rats were fed diet containing 6, 15, 60, 600, 3,600 ppm zineb. Four weeks after the beginning of the treatment, a calcium precipitation method was used for obtaining a preparation of liver microsomes from these animals. The microsomes were then taken for measuring the activity of both aminophenazone demethylase and aniline hydroxylase as well as the liver concentration of cytochrome P450 and cytochrome b_5. The weight gain was reduced by the highest dose of zineb, which corresponds to a daily intake of about one twentieth of the LD50 per os. The fungicide brings down the activity of the microsomal monoxygenases and reduces the P450 quantity. The lessening of the aminophenazone demethylation is apparent starting from a dose between 60 and 600 ppm. Aniline hydroxylation is modified at lower concentration, less than 60 ppm. The minimal diet concentration giving an action on the drug metabolizing microsomal enzymes is compared with an evaluation of the no effect level, based on the recommended acceptable daily intake. The first was found to be close to the second, or less.

77-1262. Meiniel, R. (Lab. Biol. Animal, Univ. Clermont, 63170 Aubiere, France). **Prevention des anomalies induites par deux insecticides organophosphores (parathion et bidrin) chez l'embryon de caille. [Prevention of anomalies induced by two organophosphate insecticides, parathion and bidrin, in the quail embryo.]** *Arch. Anat. Microsc. Morphol. Exp.* 65(1): 1-15; 1976. (54 references) (French)

Injection of bidrin (dicrotophos) into quail eggs prior to incubation induces beak and leg abnormalities in the embryos. Treatment with nicotinamide prevents these deformities, but it has no preventative effect on the axial anomalies caused by both parathion and bidrin. Vertebral defects are greatly reduced by treatment with pralidoxime, a cholinesterase reactivating organophosphorus antidote. In contrast pralidoxime has no effect on the beak and leg damage caused by bidrin. Two other cholinesterase reactivators, diacetylmonoxime and monoisonitrosoacetone, have no effect on either of the types of abnormalities examined. Thus it is apparent that organophosphorus compounds produce teratogenic effects by more than one mechanism.

77-1263. Solomon, L. M.; Fahrner, L.; West, D. P. (Dep. Dermatol., Coll. Med., Univ. Illinois, PO Box 6998, Chicago, IL 60680). **Gamma benzene hexachloride toxicity.** *Arch. Dermatol.* 113(3): 353-357; 1977. (88 references)

The most frequently used treatment for scabies, a current problem, is a lotion containing 1% γ-BHC (lindane). Lindane is considered moderately toxic, and some instances of adverse effects have been reported in humans treated topically with this preparation. Lindane is absorbed through the skin. Therefore caution is recommended in the use of this product in treating scabies. It should not be applied following a hot soapy bath, since this would increase percutaneous absorption of lindane. Application for periods shorter than the currently recommended 24 hr may be adequate, and a concentration weaker than 1% may suffice, especially for badly excoriated skin. Other available treatments for scabies should be considered in the case of very young children, pregnant women, or patients with badly excoriated skin.

77-1264. Ruddick, J. A.; Newsome, W. H. (Food Directorate, Health Protect. Br., Tunney's Pasture, Ottawa, Ontario, Canada). **Teratogenicity assessment of ethylenebis (isothiocyanate) in the rat.** *Bull. Environ. Contam. Toxicol.* 17(2): 159-162; 1977. (9 references)

Pregnant female Wistar rats were given 0, 12.5, 25.0, or 50.0 mg/kg ethylenebis(isothiocyanate) (EBI) by stomach tube on days 6-15 of pregnancy. EBI may be a metabolic product of carbamate fungicides. The dams and pups were examined on day 22 of gestation. A preliminary study showed the mean LD50 of EBI in rats to be 112.3 mg/kg. At 25.0 and 50.0 mg/kg, EBI significantly decreased maternal weight gain, and at 50.0 mg/kg, the pesticide degradation product significantly decreased the mean fetal weight. At 50.0 mg/kg there was also a significant drop in the number of mated dams producing no litter; in some cases, these dams showed uterine swelling. Among the dams producing litters, EBI had no effect on litter size. The pesticide produced no skeletal or visceral anomalies in the pups. If the maternal weight loss and increase in the number of dams which had no litter are mutually exclusive, EBI is embryocidal at 50.0 mg/kg, killing the embryo soon after implantation.

77-1265. Buchet, J. P.; Lauwerys, R.; Roels, H. (Unite Toxicol. Indust. Med., Univ. Cathol. Louvain, Clos Chapelle aux Champs, Brussels, Belgium). **Long term exposure to organophosphorus pesticides and lipid metabolism in the rat.** *Bull. Environ. Contam. Toxicol.* 17(2): 175-183; 1977. (19 references)

Male and female Sprague-Dawley rats were fed a standard or fat-enriched diet containing no pesticide, 100 ppm Dursban (chlorpyrifos), or 10 ppm triamiphos. After 1 yr there was no difference in body weight between the male control rats and those exposed to Dursban or triamiphos, although the exposed and nonexposed animals fed the fat-enriched diet were heavier than those fed the standard diet. The total blood cholinesterase activity was reduced by 40% in the Dursban-exposed group (males) on standard diet and by 60% in the Dursban-exposed group (males) on the fat-enriched diet. Decreases of 60% and 70%, respectively, were observed in the triamiphos-exposed males on the standard and fat-enriched regimes, and decreases of 70% and 80% were observed in the triamiphos-exposed females on the standard and fat-enriched regimes. The results showed no effect of triamiphos and Dursban on the general health or fat metabolism of the rat.

77-1266. Rodgers, R. D.; Robel, R. J. (Div. Biol., Agric. Exp. Station, Kansas State Univ., Manhattan, KS 66506). **Effects of carbaryl on body weight and fat reserves of dietetically-stressed bobwhites.** *Bull. Environ. Contam. Toxicol.* 17(2): 184-189; 1977. (5 references)

Adult male bobwhites (*Colinus virginianus*) were starved for 5 days to approximately 85% of their pre-starvation, stabilized weight, after which they were placed on reduced rations containing different levels of carbaryl. The carbaryl intake averaged 0, 4.4, 17.7, and 30.3 mg/kg/day in the different groups. After 15 days the body fat reserves of the carbaryl-fed birds did not differ significantly from those of birds fed a noncontaminated maintenance diet. Similarly, the fat reserve of the carbaryl-fed birds did not differ significantly from those of birds sacrificed immediately after the 5-day initial starvation diet. There were also no significant differences in rate of weight gain or ending weight between birds fed noncontaminated feed or feed contaminated with carbaryl.

77-1267. Dalvi, R. R.; Howell, C. D. (Toxicol. Lab., Dep. Physiol. Pharmacol., Sch. Vet. Med., Tuskegee Inst., Tuskegee, AL 36088). **Toxic effects of a fungicide, 5-ethoxy -3- (trichloromethyl)-1,2,4-thiadiazole (terrazole), on the hepatic drug metabolizing enzyme system in mice.** *Bull. Environ. Contam. Toxicol.* 17(2): 225-232; 1977. (13 references)

Male albino Swiss mice were given 2.0 or 0.25 mmol/kg of terrazole in oil (ip) or were given 100 mg/kg terrazole in oil (ip) followed by 50 mg/kg pentobarbital sodium (ip) 24 hr later. Controls were given no drug or pentobarbital alone. Administration of 100 mg/kg terrazole significantly prolonged the sleeping time observed after pentobarbital administration. The terrazole-induced effect lasted for at least 4 days, indicating that the pesticide inhibited the hepatic drug metabolizing enzyme (DME) system. The activities of benzphetamine demethylase and aniline hydroxylase in the liver microsomes were inhibited by 2 mmoles/kg terrazole and there was a concomitant loss of cytochrome P-450. Terrazole appears to require metabolism for its liver toxicity and it is likely that a terrazole metabolite(s) might be causing hepatotoxicity by initiating destructive lipid peroxidation of the microsomal membranes. The trichloromethyl moiety of terrazole may undergo metabolic alteration by the hepatic DMA system and the product thus formed may be responsible for the observed liver toxicity.

77-1268. Bezuglov, V. G.; Minenko, A. K.; Postoeva, R. A. (Agron. Sci. Res. Inst. Centr. Non-Chernozem Regions, USSR). **Gerbitsidy v sevooborote i mikroflora pochvy.** [**Herbicides in crop rotation and soil microflora.**] *Khim. Sel. Khoz.* 14(12): 45-49; 1976. (7 references) (Russian)

The effect of various combinations of herbicides on the soil microflora was studied under the conditions of an 8-yr crop rotation in meadow podzol with pH 5.8-5.9 and a humus content of 2.5-2.6%. Two to four herbicides (simazine: 0.3-0.5 kg/ha; MCPP: 1.5 kg/ha; MCPA 0.3-1 kg/ha; dinoseb: 1 kg/ha; atrazine: 0.3-0.5 kg/ha; dicamba: 0.12 kg/ha; 2,4-D amine salt: 0.6 kg/ha, and prometryne: 1.5 kg/ha) were applied every year, usually during spring. The systematic use of these herbicides throughout the crop rotation period had no significant influence on the growth and activity of the soil microorganisms. Certain herbicides, e.g., simazine and MCPP, had temporary, usually inhibitory, effects on certain microorganisms. Ammonifying bacteria and fungi as well as the nitrification capacity were most susceptible to the herbicides. Actinomycetes, microorganisms mineralizing organophosphates, denitrifying bacteria, and the soil respiration were relatively insensitive to the herbicides.

77-1269. Sedykh, A. S.; Abelentseva, G. M. (All-Union Sci. Res. Inst. Chem. Plant Protect. Ag., USSR). **Fosfororganicheskii insektitsid valekson (analiticheskii obzor).** [**The organophosphorus insecticide valexon (analytical review).**] *Khim. Sel. Khoz.* 14(8): 34-39; 1976. (75 references) (Russian)

Studies on the toxicity, degradation, and pest control efficiency of valexon (phoxim) are reviewed. Phoxim is of low toxicity for warm-blooded organisms; its acute oral LD50 in rats is 8,500-8,800 mg/kg, and the dermal LD50 is over 1,000 mg/kg. According to other researchers, the acute oral LD50 in rats is 1,880-2,060 mg/kg, and the dermal LD50 is over 1,120 mg/kg. Phoxim rapidly decomposes in the body to non-toxic metabolites. Phoxim is degraded rather rapidly in soil and in plants. A residue level of 0.2 mg/kg was found in the soil 60 days after soil treatment with a dose of 5 kg/ha. The residue levels in

tomatoes, cabbage, lettuce and apples were 0.1-0.5 mg/kg 7 days after treatment. Gas-liquid chromatographic and thin-layer chromatographic methods are available for valexon determination.

77-1270. Kruglov, Yu. V.; Maslennikova, V. G. (All-Union Sci. Res. Inst. Agric. Microbiol., USSR). **Vliianie rastitel'nykh ostatkov na detoksikatsiiu simazina v pochve.** [**Effects of plant remnants on detoxification of simazine in soil.**] *Khim. Sel. Khoz.* 14(7): 53-55; 1976. (1976 references) (Russian)

The effect of plant remnants and other organic substances in the soil on the degradation of simazine was studied in different soils in laboratory experiments. Chopped straw and glucose accelerated the degradation of simazine, which effect was especially marked in soils with low humus content. While the green mass of lupine retarded the degradation, it was accelerated by oat straw and by leaves and roots of corn plants. These tests, carried out with simazine labeled with ^{14}C in the ring, revealed slow destruction of the triazine ring. Sterilized plant remnants had no effect on simazine degradation in sterile soil, and they even retarded the degradation after sterile soil was inoculated with soil microorganisms. At any rate, the degradation was faster in the latter than in sterile soil with sterile plant remnants. The degradation in sterile soil was accelerated by fresh remnants of corn plants and retarded by fresh remnants of lupine. The lack of effect of sterile plant remnants is due to the inactivation of benzoxazinone analogs and of polyphenol oxidase in plant materials by sterilization. The degradation-retarding effect of lupine plants is due to the fact that they contain very small amounts of benzoxazinone analogs and of polyphenol oxidase, if any.

77-1271. Zatserkovskii, V. A.; Zatserkovskaya, G. A.; Baryshpol', O. Ya. (Ukrainian Sci. Res. Inst. Plant Protect., USSR). **Vliianie khlororganicheskikh insektitsidov na dinamiku pitatel'nykh veshchestv v pochve.** [**Effects of organochlorine insecticides on nutrient dynamics in soil.**] *Khim. Sel. Khoz.* 14(7): 51-53; 1976. (12 references) (Russian)

The effect of lindane (0.75 kg/ha), polychloropinene (strobane) (4.8 kg/ha), and polychlorocamphene (toxaphene) (2.4 kg/ha) on nutrient dynamics was studied in the upper 20-cm layer of chernozem. The residues, whose concentrations were in the range of 0.2-0.5 mg/kg, failed to interfere with the nutrient supply of the soil. Polychloropinene and polychlorocamphene, which activated the microbiological processes in the soil, increased its ammonia and nitrate nitrogen contents, and, to a lesser degree, also increased the mobile phosphorus content.

77-1272. Steinberg, G. M.; Cramer, J.; Ash, A. B. (Biomed. Lab., Edgewood Arsenal, MD 21010). **New reactivators of phosphonylated acetylcholinesterase.** *Biochem. Pharmacol.* 26(5): 439-441; 1977. (17 references)

Reactivation studies have been performed with a large number of quaternary pyridinium compounds containing the aldoximino group, without major improvement over pralidoxime and obidoxime. Additional members of this group were synthesized in which the pralidoxime units were linked more distantly from the aldoximino group, at the 5-position, to eliminate presumed steric hindrances. The results of reactivation studies were disappointing, as there was no improvement over the reactivation rates achieved with pralidoxime. The assumption that the product of oxime reactivation was identical with the original enzyme was also confirmed in these studies.

77-1273. Guenthner, T. M.; Mannering, G. J. (Dep. Pharmacol., Univ. Minnesota Med. Sch., Minneapolis, MN 55455). **Induction of hepatic mono-oxygenase systems in fetal and neonatal rats with phenobarbital, polycyclic hydrocarbons and other xenobiotics.** *Biochem. Pharmacol.* 26(5): 567-575; 1977. (42 references)

The induction of hepatic P-450 hemoprotein-dependent mono-oxygenase systems was studied in fetal and neonatal rats. The fetal liver was refractive to phenobarbital induction of aminopyrine and ethylmorphine *N*-demethylase, which are cytochrome P-450-dependent mono-oxygenases, but was not refractive to the 3-methylcholanthrene induction of benzo[a]pyrene hydroxylase, a' cytochrome P_1-450-dependent mono-oxygenase. After parturition, all three enzyme activities were inducible. These and other observarions suggest that a control mechanism operates in the fetal rat which selectively suppresses the induction of cytochrome P-450, but allows induction of cytochrome P_1-450. This selective suppression of phenobarbital induction in the fetus was reversed in part by the simultaneous administration of 3-methylcholanthrene. Several other inducing agents also partially reversed the suppression of phenobarbital induction in fetal livers: dibenzo-[a,c]anthracene, 2-diethylaminoethyl -2,2- diphenylvalerate (SKF 525-A), and 3β-hydroxy -20- oxypregn -5- ene-16α-carbonitrile (PCN). Other inducing agents were inactive: α-naphthoflavone, β-naphthoflavone, 1,1-bis[*p*-chlorophenyl] 2,2,2- trichloroethane (DDT), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), dieldrin, chlordane and chlorpromazine.

77-1274. Vasic, B. V.; Milosevic, M. P.; Terzic, M. R. (Dep. Pharmacol., Med. Fac., Belgrade, Yugoslavia). **Acetylcholine content and cholinesterase activity in the ponto-medullary region of brain in rats treated with armin and obidoxime.** *Biochem. Pharmacol.* 26(5): 601-602; 1977. (8 references)

The lethal dose of armine (0.4 mg/kg, s.c.) produced an increase in the total acetylcholine content and a marked degree of cholinesterase inhibition in the region of pons and medulla oblongata of rats. The intraperitoneal

injection of obidoxime (25 mg/kg), given 5 min after armine administration, significantly prevented the rise of acetylcholine content (25%) and produced a satisfactory reactivation of cholinesterase in the same tissue (33%). The decrease of accumulated acetylcholine by obidoxime seems to be in good correlation with the degree of cholinesterase reactivation in the investigated tissue.

77-1275. Ishii, H.; Suga, T.; Niinobe, S. (Dep. Clin. Biochem., Tokyo Coll. Pharm., Tokyo, Japan). **Effect of 3-amino-1,2,4-triazole treatment on catalase activity and triglyceride level in fatty liver of the rat.** *Biochem. Pharmacol.* 26(5): 625-628; 1977. (16 references)

The effect of 3-amino-1,2,4-triazole (amitrole, AT) pretreatment on the triglyceride (TG) level in CCl_4 (2.5 ml/kg, s.c.)-, ethanol (1 g/kg, i.p.)- induced fatty liver in rats was studied, and the relationship between liver catalase activity and TG metabolism was investigated. The intoxication by each hepatotoxin increased the liver TG level in the rats. However, when the rats were pretreated with AT (1 g/kg, i.p.), the liver TG level decreased about 50 per cent, and the liver catalase activity was inhibited about 85 per cent. When AT and CCl_4 were injected simultaneously, they repressed about 50 per cent of the increase in the TG level caused by intoxication with CCl_4. When AT alone was injected before the intoxication with ethanol, the liver catalase activity decreased by 50 per cent of that of the ethanol group and the increase in liver TG level was lowered by 40 per cent. On the other hand, when AT was injected after ethanol, the increase in liver TG level was depressed, although a decrease in catalase activity was not found. Although the serum TG level was decreased by CCL_4 treatment and increased by the ethanol treatment, AT did not show any effect on these changes. These results suggest that AT acts independently on the TG level and catalase activity in the liver.

77-1276. Wecker, L.; Mobley, P. L.; Dettbarn, W. D. (Dep. Pharmacol., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Central cholinergic mechanisms underlying adaptation to reduced cholinesterase activity.** *Biochem. Pharmacol.* 26(5): 633-637; 1977. (26 references)

Paraoxon (Px), an irreversible cholinesterase (ChE) inhibitor, was administered acutely and chronically to rats in order to elucidate the mechanisms involved to the process of adaptation. Brain levels of acetylcholine (ACh) as well as ChE and cholineacetyltransferase (CAT) activities were investigated to further understand the relationship between chronically reduced ChE levels and neurotransmitter mobilization. In acutely treated animals, cholinergic symptoms were evident 15 min after injection and were accompanied by a 100 per cent increase in total brain ACh and an 83 per cent decrease in ChE activity. In low-dose chronically treated animals, symptoms did not ensue until 3 days of treatment, when total ACh levels reached a maximum of 50 per cent above control and ChE activity was 55 per cent inhibited. Free ACh levels increased in both acutely and chronically treated animals, whereas bound ACh levels increased significantly only in the acutely treated group. These results suggest that (1) cholinergic central nervous system symptoms can be correlated with an increase (50 per cent) in brain ACh, and (2) chronic ChE inhibition may lead to alterations in the presynaptic mobilization and storage of ACh.

77-1277. Sterri, S. H. (Norwegian Def. Res. Establ., Div. Toxicol., Kjeller, Norway). **Effect of imidazole and pH on aging of phosphylated acetylcholinesterase.** *Biochem. Pharmacol.* 26(5): 656-657; 1977. (27 references)

The effect of imidazole and its derivatives on aging of acetylcholinesterase (AChE) phosphylated by sarin and DFP was investigated in vitro. Imidazole in the protonated form retarded the rate of aging of phosphylated AChE, possibly by binding to a group on the enzyme similar to the anionic site. The results were consistent with a retardation mechanism in which aging is completely blocked following binding of effector compound. The pH dependence of aging differed in the presence and absence of cationic effector compounds, probably because the affinity of the enzyme for the effector compounds increases with increasing pH.

77-1278. Seidenfeld, J.; Wycoff, D.; Zavala, D.; Richerson, H. (Dep. Int. Med., Univ. Iowa, Iowa City, IA). **Paraquat lung injury in rabbits.** *Clin. Res.* 25(3): 423A; 1977.

An aerosol model was developed for the study of paraquat toxicity. Three groups of New Zealand white rabbits were exposed for two hours a week for five weeks using a 1341 chamber and an ultrasonic nebulizer. The six rabbits in group I were exposed to paraquat at 10 g/100 cc of double distilled water; the 24 rabbits in group II to 200 mg paraquat in 100 cc of water, and the third group to water alone. All animals exposed to the high dose died in 38 hr. Autopsy revealed heavy scarlet lungs with extensive hemorrhagic pneumonitis. Significantly reduced arterial oxygen tension and increased alveolar-arterial oxygen gradient were seen in the low-dose group; specific pulmonary compliance was decreased and functional residual capacity and respiration rate were increased. Paraquat was uniformly distributed in the lungs and appeared to accumulate upon repeated administration. Urinary paraquat levels were higher than those reported for humans exposed to paraquat spray. Heart and lung weights were significantly increased. Histological examination revealed focal interstitial fibrosis, interstitial thickening, macrophage proliferation in alveoli and interstitium, epithelioid changes, type II cell hyperplasia, and acute inflammation foci with consolidation.

77-1279. Yoshihara, S.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN). **Comparison of the metabolism of parathion**

by a rat liver reconstituted mixed-function oxidase enzyme system and by a system containing cumene hydroperoxide and purified rat liver cytochrome P-450. *Drug Metab. Disposit.* 5(2): 191-197; 1977. (21 references)

A reconstituted mixed-function oxidase system (rat liver cytochrome P-450, NADPH-cytochrome c reductase, dilauroyl phosphatidylcholine, deoxycholate, and NADPH) was prepared and compared with a cumene hydroperoxide system (cytochrome P-450, dilauroyl phosphatidylcholine, and cumene hydroperoxide) for the metabolism of parathion. The products formed in incubation with either system were paraoxon, diethyl phosphorothioic acid, *p*-nitrophenol, and atomic sulfur. The apparent reaction constants for formation of paraoxon and diethylphosphorothioic acid were not significantly different using either of the two systems. With both the reconstituted mixed-function oxidase system and the cumene hydroperoxide system about 65% of the sulfur released became bound to the proteins of the enzyme systems. Binding of the sulfur atom resulted in progressive inhibition of parathion metabolism by these two systems.

77-1280. Nagymajtenyi, L.; Berencsi, Gy. (Inst. Hyg. Epidemiol., Szeged Medical School, Szeged, Hungary). **Uj keszulek kulonbozo vegyi angyagok aerogen toxicitasanak allatkiserletes vizsgalatahoz. [New instrument for aerogenic toxicity studies of chemical agents in animals.]** *Egeszsegtudomany* 20(4): 379-382; 1976. (6 references) (Hungarian)

An inhalation chamber for the study in mice of the toxicity of inhaled chemicals, such as pesticides, is described. The animals are accommodated individually in 25 glass tubes, one end of which communicates with the inhalation chamber at the height of the nose of the animals. The substance to be tested is introduced into the inhalation chamber in the form of aerosol generated from its solutions; 94% of the aerosol particles are under 5 μg. The aerosol concentrations are the same for all animals, which permits reproducible tests.

77-1281. Willhite, C. C.; Sharma, R. P. (Toxicol. Program, Utah State Univ., Logan, UT 84322). **Effect of acute dieldrin exposure on brain serotonin, 5-hydroxyindole acetic acid and monoamine oxidase in three animal species.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 356; 1977.

Neurotoxic effects of various insecticides may be associated with the alteration of brain biogenic amines, or their metabolism, or the disposition of their metabolites. Rainbow trout, White Leghorn chickens and Golden hamsters were given single doses of varying amounts (10-100 mg/kg) of dieldrin, intraperitoneally or orally. Whole brain levels of serotonin (5-HT), and its metabolite, 5-hydroxyindole acetic acid (5-HIAA) were measured. Acute exposure of trout to dieldrin increased the 5-HT concentration and decreased 5-HIAA levels. The 5-HIAA level was not changed in the high dose group. Dieldrin treated chickens showed a significant increase in 5-HT and a corresponding decrease in 5-HIAA levels. Both 5-HT and 4-HIAA levels were unaltered in dieldrin exposed hamsters. Dieldrin added in vitro to whole brain homogenates from chicken or hamster in low concentrations (10^{-8} to 10^{-6} M) decreased the brain monoamine oxidase (MAO) activity. Such MAO inhibition was not observed in the case of trout brain homogenates. In hamsters the results can be explained by simultaneous MAO inhibition and interference with 5-HIAA efflux from brain by dieldrin. These two functions seem to be sensitive to dieldrin in different ranges of exposures. The MAO inhibition in vivo but lack of sensitivity of the 5-HIAA transport mechanism to dieldrin in chicken and fish was suggested by the results.

77-1282. Luthra, Y. K.; Esber, J. J.; Gralla, E. J.; Hagopian, M.; Marcus, W. (Mason Res. Inst., Worcester, MA). **Serum lipoprotein profile of dogs treated with hexachlorobenzene.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 356; 1977.

Hexachlorobenzene (HCB), a lipophilic chemical used as a fungicide, has caused increasing concern as an environmental contaminant. HCB residues have been detected in adipose and other tissues of animals and humans. Among the serum biochemical changes, HCB has caused significant changes in total serum lipids, cholesterol and triglycerides of beagle dogs. The present study was undertaken to investigate the effect of HCB on serum lipoprotein patterns. Male and female beagle dogs were treated orally with 1, 10 and 100 mg/day of HCB in gelatin capsules for 13 weeks. Sera were collected at the end of the treatment period following 12 hr of fasting. Electrophoretic separation of the lipoproteins was carried out in agarose-gel and quantitated by densitometry. The percent distribution for control animals was 37 ± 6 for β-lipoprotein; 16 ± 8 for pre-β fraction and 47 ± 11 for the α-lipoprotein. Statistical analysis by the Dunnett's multiple comparison method showed a non-dose related decrease of 13-40% ($P < .01$) in the β-lipoprotein and an increase of 28-46% ($P \chi .025$-$.01$) in the α-lipoprotein fractions. No significant change was observed in the pre-β fraction. These results support the suggestion that HCB interferes with lipid metabolism and/or transport. (Author abstract by permission) (Abstract No. 460)

77-1283. Campbell, K. R. (Univ. Michigan, Ann Arbor, MI 48109). **Serum LH response to castration in adult rats neonatally injected with *o,p'*-DDT.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 396; 1977.

This study examined whether neonatal injection of 1,1,1-trichloro -2- (2-chlorophenyl) -2- (4-chlorophenyl)-ethane (*o,p'*-DDT) into male rats modified the adult response to castration and whether this modification could be blocked by the hepatic antagonist 2'-diemthylaminoethyl -2,2- diphenylpentanoate (SKF-525A) or potentiated by the hepatic inducer phenobarbital. Groups of newborn rats were injected daily for the first 5

days of life with: (I) 0.05 ml sesame oil, (II) 2 mg DDT, (III) 2 mg DDT plus 125 μg SKF-525A, or (IV) 2 mg DDT plus 2 dose of 100 μg sodium phenobarbital. Serial blood samples were taken between 57 and 75 days of age; castration was performed on day 60. Serum samples were analyzed for luteinizing hormone (LH) by double-antibody radioimmunoassay. Serum LH among the groups differed only between days 61 and 71. Serum LH in group II animals rose to only 70% of the levels seen in group I controls ($p < 0.05$). Subjectively, the LH profile of group III (SKF) resembled that of the controls while the profile of group IV (phenobarbital) fell between groups II and III. The integrity of the negative feedback system was tested by the injection of 0.75 mg/kg of testosterone 6 hours prior to bleeding on day 74; serum LH decreased 25-40% in all groups. The results suggest that *o,p'*-DDT may act via a metabolite to cause long term alterations of the hypothalamo-hypophysial axis though it does not destroy the major responses of that system. (Author abstract by permission) (Abstract No. 671)

77-1284. Van Miller, J. P.; Allen, J. R. (Univ. Wisconsin, Madison, WI 53706). **Chronic toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 396; 1977.

Male Sprague-Dawley rats (10 animals per group) were fed diets containing various levels of 2,3,7,8-tetrachlorodibenzo*p*-dioxin (TCDD) for 65 weeks. Acute toxic effects including severe liver necrosis, bile duct hyperplasia and edema, atrophy of the thymus and spleen, hemorrhage in the gastrointestinal tract, and decreased spermatogenesis were observed in animals receiving 1.0, 0.5 and 0.05 ppm TCDD. All of the animals in these groups died within 4 weeks. Weight gain in groups receiving 5.0 and 1.0 ppb TCDD was significantly lower than controls, and 50% and 40% mortality, respectively, occurred over 65 weeks. The remaining groups (0.5, 0.05, 0.005 and 0.001 ppb) had an 8% mortality rate in 65 weeks. Moderate liver alterations as well as bile duct hyperplasia and edema were common in all 12 animals that died. Death of 3 of the animals in the 5.0 ppb group was attributed to aplastic anemia. In 6 of the remaining 9 animals that died neoplastic changes were observed including carcinomas of the kidney (2), liver (2) and skin (1) and an angiosarcoma. In addition, laparotomies and biopsies have indicated 2 additional neoplasms including a bile duct carcinoma and an angiosarcoma. After 18 months all of the animals will be removed from the TCDD diet and further evaluated. (Author abstract by permission) (Abstract No. 673)

77-1285. Mansour, N. A.; Eldefrawi, A. T. (Dep. Pharm. Exp. Ther., Univ. Maryland Sch. Med., Baltimore, MD 21201). **Interaction of pesticides with the acetylcholine receptor.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 396; 1977.

Several organophosphorus and carbamate insecticides and organic mercury fungicides (at 0.1 m*M*) inhibit the binding of [^{3}H]acetylcholine to membrane bound acetylcholine-(ACh-) receptors of electric organs of *Torpedo ocellata*. Some compounds block the binding of ACh to its receptor irreversibly. There is no correlation between the antiacetylcholinesterase potency of each compound and its inhibition of ACh-binding to the ACh-receptor. The effect of these compounds on efflux of $^{22}Na+$ from excitable microsacs, prepared from Torpedo electric organs, is also studied to evaluate the toxicologic significant of these interactions. (Author abstract by permission)

77-1286. Herin, R. A.; Suggs, J. E.; Lores, E. M.; Prather, A.; Farmer, J. (Health Eff. Res. Lab., Environ. Pollut. Ag., Research Triangle Park, NC 27711). **Correlation of salt gland function and brain acetylcholinesterase activity with levels of chlorpyrifos in the feed of mallard ducklings.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 397; 1977.

The salt gland of the mallard duckling, *Anas platyrynchos*, has been proposed as a model for testing the toxicity of organophosphorous pesticides because these compounds depress the function of the gland. This study was done to see if there was a correlation between increasing pesticide dose and decreasing brain acetylcholinesterase activity and decreasing salt gland function. Ducklings were fed various levels of pesticide in the feed and given either salt or fresh water ad libitum for two weeks. Comparison of salt gland function, brain acetylcholinesterase activity and brain pesticide levels showed that there was correlation between all of these parameters and dose of pesticide in the feed, i.e. as pesticide dose increased brain pesticide levels increased, acetylcholinesterase activity decreased and salt gland function decreased. These results support the premise that the salt gland of the mallard duckling may be a useful non-sacrificial model for testing exposure to organophosphorous pesticides. (Author abstract by permission) (Abstract No. 677)

77-1287. Abou-Donia, M. B. (Dep. Physiol. Pharmacol., Duke Univ. Med. Cetr., Durham, NC 27710). **Pharmacokinetics of a topically applied sub-neurotoxic dose of leptophos.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 412; 1977.

The pharmacokinetic profile of a topically applied subneurotoxic dose of leptophos [*O*-(4-bromo-2,5-dichlorophenyl) 0-methyl phenyl-^{14}C-phosphonothioate] was determined in laying hens. A single oral dose of 50 mg/kg (1.0 μCi) of ^{14}C-leptophos in acetone (0.5 ml) was administered to the comb. A total of 34.89% of the applied dose was absorbed through the skin during the 20 day experiment. A major part of the absorbed radioactivity was excreted in the combined urinary-fecal excreta (24.31%). Significant amounts e.g. 2.64% and 2.01% of the dose were deposited in egg albumen and yolk respectively. Only 1.38% was excreted in the expired CO_2. Radioactivity in tissues reached a peak of 16.38% 12 hours after the

administration, which was decreased to 4.49% at 20 days (27.41% of peak value). Highest ^{14}C contents were present and peripheral nerve tissues contained small but constant amounts of ^{14}C throughout the experiment. Following the dermal administration of ^{14}C leptophos a biphasic body level curve was observed. The half-life for the elimination of ^{14}C from the birds' body was 11.5 days corresponding to a rate value of 0.06/day. Most of the radioactive substance in the excreta was identified as unchanged leptophos with minor polar metabolites. (Author abstract by permission) (Abstract No. 767)

77-1288. Schmitt, S. L.; Van Orden, L. S. III; Autor, A. P. (Toxicol. Ctr., Dep. Pharmacol., Univ. Iowa, Iowa City, IA 52242). **Effect of paraquat on alveolar macrophages and type II pneumocytes isolated from rat lungs.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 413; 1977.

A study was undertaken to determine which type or types of cells are involved in the energy-dependent uptake of paraquat in lung tissue. Alveolar macrophages and type II pneumocytes were isolated from the excised lungs of normal adult rats. The cells were incubated at 37°C in Gibco nutrient medium F-12K with and without paraquat. Cell viability was determined by the trypan blue exclusion technique. After an incubation period of one hour in 0.1 ml paraquat, 94% of the alveolar macrophages remained viable when compared with control cells incubated under the same conditions in the absence of paraquat. In the presence of 1 mM paraquat, 83% of the cells remained viable. The presence of superoxide dismutase at 100 μgml throughout the incubation had no effect on paraquat lethality after 60 minutes of exposure. After one hour of incubation in 0.1 mM paraquat, 72% of the type II pneumocytes remained viable. After one hour of incubation in 1 mM paraquat, only 50% of the cells remained viable. Although both types of pulmonary cells studied appear to be sensitive to the presence of paraquat, these results suggest that the type II pneumocytes may be more susceptible to paraquat toxicity than alveolar macrophages. (Author abstract by permission) (Abstract No. 770)

77-1289. O'Neil, J. J.; Engelbrecht, F. M. (Natl. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Increase of oxygen consumption and pentose pathway activity of rat lung slices in the presence of glucose.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 480; 1977.

The *in vitro* effect of paraquat (PQ) was studied on the oxygen consumption (Q02) and oxidation (Ox) of radiolabelled substrates in 1 mm rat lung slices. In the presence of PQ, when glucose (G1) was used as substrate, Q02 increased up to 50%, and Ox of 1-14C-G1 increased up to 3 fold, whereas Ox of 6-14C-G1 increased only slightly, compared to controls. These responses were dose dependent (10 μM to 10^3 M PQ). The initial stimulatory phase was followed by a decrease in activity to below control values. When no G1 was added, the initial increase in QO2 decreased below control values. A depression of metabolic activity by PQ was found in the presence of added G1 when we measured (1) the incorporation of 14C-labeled acetate and leucine into lipid and protein respectively, (2) the Ox of 14C-labeled alanine, acetate, and palmitate, and (3) the lactate production and glucose consumption. The initial increase of QO2 appears to be related to pentose pathway (PP) activity. When G1 is present and the PP active, the depression in QO2 is delayed but not diminished. All metabolic activities measured were ultimately depressed in the presence of PQ. Because the degree of depression is time and dose dependent, the acute metabolic lesion is probably related to the intracellular accumulation of PQ. (Author abstract by permission) (Abstract No. 1098)

77-1290. Laskowski, M. B.; Dettbarn, W. D. (St. Louis Univ., St. Louis, MO). **An electrophysiological analysis of paraoxon on mammalian skeletal muscles.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 559; 1977.

Paraoxon (10μM to 10mM), an organophosphorus inhibitor of cholinesterase (ChE) was applied *in vitro* to rat diaphragm, soleus and FDL muscles and the frog sartorius. The drug (100 μM) reduced diaphragm surface ChE to 1% of control and caused a 15 mV muscle membrane depolarization with a simultaneous increase in spontaneous MEPP frequency to 7.23 ± 1.2/sec. End-plate regions were significantly more depolarized (-59.9 ± 0.55 mV) than non-end-plate regions (-64.3 ± 0.9 mV). Control RMPs in both regions were -75.0 ± 0.25 mV. Tetrodotoxin (TTX, μM) partially reversed the depolarizatin effects of paraoxon to -67 ± 0.58 mV at end-plate and non-end-plate areas. TTX also reversed the faster MEPP frequency. Pretreatment with α-bungarotoxin (10 μg/ml) prevented the effects of paraoxon slightly more at end-plate regions (-69.9 ± 0.58 mV) than at non-end-plate (-67.6 ± 0.89 mV). 2-PAM (pyridine-2-aldoxime methiodide, 10^{-3}M) produced similar results. Indirect stimulation initiated repetitive muscle action potentials in 100 μM paraoxon. High Mg or replacement of 75% of Na with sucrose eliminated the repetitive activity, and the drug had no effect on K+ conductance. These results indicate that paraoxon depolarized muscle membranes partly through direct action but also through ChE inhibition and increased transmitter release. (Author abstract by permission) (Abstract No. 1521)

77-1291. Ranish, N.; Dettbarn, W. D. (Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **The effect of pargyline and serotonin on fast axoplasmic transport in sciatic nerve.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 560; 1977.

Paraoxon, an organophosphorus cholinesterase inhibitor, and pargyline, a monoamine oxidase inhibitor, both induce muscle necrosis. We have previously shown that paraoxon does not change the transport of cholinesterase or precursor labeled proteins under these conditions. However, recent studies suggest that pargyline and other monoaminergic agents can induce altered rates of

fast axoplasmic transport (*J. Neurochem.* 26: 737, 1976). We have, therefore, reexamined this question by determining the effect of muscle demaging doses of pargyline and serotonin on fast axoplasmic transport of labeled proteins in rat sciatic nerve. Male rats (160-220 g) were injected with a single dose of pargyline (125-150 mg/kg, ip) for 1, 3, or 6 days, or serotonin (80 mg/kg, ip) for 1 or 3 days. Twenty-four hours after the last dose, transport was studied after injection of H^3-l-leucine into ventral horn regions of spinal cord in the vicinity of the motor neuron somas of sciatic nerve. At intervals from 0.5-3.5 hours after isotope injection, sciatic nerves with attached ventral roots were taken and cut into 3 mm segments for liquid scintillation counting. The results obtained were expressed as cpm/3 mm segment. Typical fast axoplasmic transport profiles were obtained. The rate of fast transport in sciatic nerves of untreated animals was close to 400 mm/day. Drug treatments had no effect on the rate of fast transport in contrast to the previous observations. (Author abstract by permission) (Abstract No. 1525)

77-1292. Johnson, E. F.; Muller-Eberhard, U. (Scripps Clin. Res. Fdn., La Jolla, CA 92037). **Multiple forms of cytochrome P-450 from liver microsomes of rabbits treated with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 833; 1977.

Three forms of cytochrome P-450, designated *a*, *b*, and *c* were isolated with specific contents of 9.7, 12.0 and 17.8 nmoles cytochrome P-450 per mg protein. Molecular weights estimated by polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate were 60,000 for the *b* and 54,500 for the *c* form. The *a* fraction consists of several peptides; the most prominent corresponds to a molecular weight of 48,000. The presence of high spin ferric heme is suggested by the absorption spectrum of oxidized cytochrome P-450*c*. Forms *a* and *b* display spectra typical of low spin ferric heme. Antibodies developed with the other forms. Benzo[*a*]pyrene activity is catalyzed primarily by the *b* form and acetanilide hydroxylation by the *c* form. Both cytochromes are equally active in the *O*-deethylation of 7-ethoxyresorufin but exhibit low activity with benzphentamine as a substrate. Thus, there appear to be at least three discrete forms of cytochrome P-450 in rabbit liver microsomes following 2,3,7,8-tetrachlorodibenzo-*p*-dioxin treatment. (Author abstract by permission)

77-1293. Fasco, M. J.; Piper, L. J.; Kaminsky, L. S. (N.Y. State Dep. Health, Div. Labs. Res., Albany, NY 12201). **Warfarin metabolism -- a probe or hepatic cytochrome P-450 multiplicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 844; 1977.

Hepatic microsomal cytochrome P-450 (P-450) catalyzed metabolism of R and S warfarin to varying quantities of monohydroxylated products (6-OH, 7OH-, 8OH, 4′ OH- and benzylic OH-qarfarin) is a probe for multiplicity of P-450. The analysis of Porter et al. (*Biochem. Pharmacol.*, in press) was applied to perturbations of the microsomal system: (1) the ages of the experimental animals were varied which altered P-450 levels and (2) cumene hydroperoxide (CHP) was substituted for NADPH and oxygen. Perturbed: unperturbed product radios were compared for each metabolite of R and S warfarin. Equivalent ratios for two or more products imply participation of a single P-450 for both products while different ratios indicate different P-450s. Ratios with CHP and phenobarbital-induced microsomes implicate four P-450s: (1.60) catalyzing R 4′ OH-, R 6 OH- and S 6 OH-warfarin; (4.79) catalyzing S benzylic OH- and S 4′-OH- warfarin; (14.31) catalyzing R benzylic OH-warfarin; and (0.39) catalyzing R 7 OH- and S 7 OH-warfarin formation. 8 OH-warfarin was not observed with CHP. Product ratios at a variety of ages across the age span varied in predictions of numbers of P-450s and in the combinations of metabolites arising from a single P-450, probably as a consequence of the existence of varying concentrations of the different P-450s at different ages combined with the absence of complete specificity of each P-450. (Author abstract by permission)

77-1294. Fiscus, R. R.; Van Meter, W. G. (Iowa State Univ., Ames, IA 50011). **Effects of parathion on turnover and endogenous levels of norepinephrine (NE) and dopamine (DA) in rat brain.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 951; 1977.

Effects of maintained cholinergic stimulation on turnover and endogenous levels of NE and DA were studied in cerebral cortex, corpus striatum and brain stem of adult male hooded rats. Long-Evans strain rats were treated with parathion in doses that approximated the ED50 for overt symptoms of persistent cholinesterase (ChE) inhibition. Hippocampal ChE activity (pH-stat) served as an index for ChE inhibition in the brain areas used for catecholamine analysis. Degree of ChE inhibition was then used as criteria of treatment rather than dose of parathion. Standard fluorometric methods were used to assess endogenous levels of NE and DA as well as turnover, which was estimated by inhibition of synthesis with alpha-methyl-paratyrosine. It was found that maintained ChE inhibition decreased endogenosu levels of NE ($P < 0.005$) and DA ($P < .025$) in the cerebral cortex and increased turnover of NE in cerebral cortex ($P < .05$) and brain stem ($P < .01$). In addition, DA turnover was found to be increased in corpus striatum ($P < .02$) but decreased in cerebral cortex ($P < .02$). It is concluded that while the administration of parathion results in altered turnover and levels of endogenous NE and DA in rat brain, the changes vary in the different brain areas and with the degree of ChE inhibition, which may in turn reflect the degree of cholinergic stimulation. (Author abstract by permission) (Author No. 3589)

77-1295. West, S. B.; Huang, M. T.; Lu, A. Y. H. (Dep. Biochem. Drug Metab., Hoffmann-La Roche Inc., Nutley, NJ 07110). **Liver microsomal DT diaphorase: noninvolvement in hydroxylation of benzo(a)pyrene.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 959; 1977.

DT diaphorase, and enzyme found in the liver cytosol and microsomal membrane, catalyzes the oxidation of NADPH and NADP by various redox dyes and quinones, but its physiological function is still not known. It has been postulated based on the parallel induction of DT diaphorase activity and benzo(a)pyrene (BP) hydroxylase in rat liver by 3-methylcholanthrene (3MC) and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin that DT diaphorase may function as an electron carrier in the microsomal hydroxylation of BP (Lind et al., *B.B.R.C.* 56: 392 (1974); Beatty et al., *B.B.R.C. 68:* 197 (1976)). We have concluded based on the following results that DT diaphorase is not involved in the hydroxylation of BP to its phenolic products. 1) A highly purified reconstituted system isolated from the microsomes of 3MC-treated rats consisting of cytochrome P-448, NADPH-cytochrome c reductase and synthetic dilauroyl phosphatidylcholine had no DT diaphorase activity, but hydroxylated BP at a faster rate than microsomes from 3MC-treated rats. 2) Dicumarol at concentrations known to inhibit DT disphorase activity did not affect the rate of BP hydroxylation in this reconstituted system. 3) Highly purified DT diaphorase isolated from the liver microsomes of 3MC-treated rats when added to this reconstituted system did not stimulate or inhibit BP hydroxylation, nor could it replace NADPH-cytochrome c reductase in supporting BP hydroxylation. (Author abstract by permission) (Abstract No. 3634)

77-1296. Huang, N. T.; Lu, A. Y. H. (Dep. Biochem. Drug Metab., Hoffmann-La Roche Inc., Nutley, NJ 07110). **Liver microsomal DDT diaphorase: solubilization and purification.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 959; 1977.

Rat liver microsomal DT diaphorase, live the cytochrome P-450-containing monooxygenase system, is inducible by treating animals with 3-methylcholanthrene or 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. In order to evaluate the role of DT diaphorase in liver microsomal electron transport, this membrane-bound enzyme was purified from 3-methylcholanthrene-treated rats. Microsomes were solubilized with the nonionic detergent Renex 690 and fractionated on a DEAE-Sephadex column to separate DT diaphorase from NADPH-cytochrome c reductase. The crude DT diaphorase fraction was applied to an agarose-hexane-adenosine 3′,5′-diphosphate affinity column and the enzyme subsequently eluted with NADP+. The final preparation was purified over 675-fold. Polyacrylamide gel electrophoresis in the presence of sodium dodecyl sulfate showed one major protein band with a minimal molecular weight of approximately 32,000 and two minor bands. The purified enzyme catalyzed the reduction of cytochrome c using menadione as an intermediate electron carrier and the reduction of dichlorophenol indophenol. NADH and NADPH were equally effective as electron donors. Nonionic and cationic detergents, bovine serum albumin and dilauroyl phosphatidylcholine stimulated the rate of reduction of dichlorophenolindophenol catalyzed by the purified DT diaphorase, but anionic detergents had no effect. (Author abstract by permission) (Abstract No. 3635)

77-1297. Butcher, S. H.; Butcher, L. L. (Dep. Pharmacol. Psychol., Univ. California, Los Angeles, CA 90024). **Effects of DFP on neostriatal acetylcholinesterase (AChE, EC3,.1.1.7) and on levels of synthesis of acetylcholine (ACh) and choline (Ch) in the caudate-putamen nucleus.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 978; 1977.

Rats were intramuscularly administered 1.5 mg/kg *bis* (1-methyl-ethyl) phosphorofluoridate (DFP) and were sacrificed by microwave irradiation (see Butcher et al. 1976, *Life Sci.*, 18, 733) at various times thereafer. The neostriatum was dissected out and processed for $^{2}H_{0}$- and $^{2}H_{9}$-ACh and $^{2}H_{0}$- and $^{2}H_{9}$-Ch according to the gas chromatographic/mass spectrometric method of Jenden et al. (1973, *Anal Biochem.*, 55,438). In parallel experiments ChE was histochemically assessed according to the procedure in Butcher et al. (1975, *J. Neurol Trans.*, 37, 127). Neostriatal $^{2}H_{0}$-ACh levels were increased 112-143% over baseline 1, 2, 3, 4, 5, and 8 hr after DFP; thereafter they decreased to 61-69% of control at 19 and 25 hr postinjection before returning to baseline levels at 48 hr. ACh synthesis was initially reduced but recovered to control 4 hr after DFP and exceeded baseline by 39-79% at 19 and 25 hr. $^{2}H_{0}$-CH levels were depressed at all post-injection intervals studied whereas $^{2}H_{9}$-Ch appeared unchanged. The increase in neostriatal $^{2}H_{0}$-ACh paralleled diminished AChE activity in neostriatal neuronal elements. Although total amounts of AChE were still reduced at 19 and 25 hr after DFP, the enzyme appeared more active in certain subcellular constitutents, perhaps accounting for the biochemical results. Feedback mechanisms must also be considered. (Author abstract by permission) (Abstract No. 3735)

77-1298. Wecker, L. (Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Alterations in brain acetylcholine under conditions of chronic cholinesterase inhibition.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 978; 1977.

Rats were treated for 1-7 days with atropine (5-100 mg/kg, ip), paraoxon (0.3 mg/kg, ip) or atropine followed by paraoxon to elucidate possible mechanisms underlying adaptation to chronic cholinesterase (ChE) inhibition. Total brain acetylcholine (ACh) increased steadily during initial paraoxon treatment and reached a maximum (150% control) by day 3. Continued administration (days 4-7) did not produce further increases. ChE activity decreased steadily during the 7 day treatment period to less than 20% control. Atropine produced a 25% decrease in total ACh, evident in the bound fraction only, after initial injection.

Values remained at this level for the 7 day treatment period. When animals were pretreated with atropine, the paraoxon induced increase in ACh was prevented on day 1-3. After this period, however, ACh levels continued to increase, despite atropine treatment. By day 7, ACh levels in atropine pretreated animals were not significantly different from paraoxon only treated animals. Results are in support of a neuronal feedback mechanism in brain related to ChE activity. It is suggested that during day 3-7, when there is a sufficient loss of ChE activity, there is a gradual accumulation of extracellular ACh that depresses further neurotransmitter release induced by atropine. (Author abstract by permission) (Abstract No. 3736)

77-1299. Hinman, D. J.; DeVera, H. V.; Wilson, K. M.; Barrett, E. L. (U. S. Army Biomed. Lab., Edgewood Arsenal, Maryland 21010). **Effects of chronic administration of pyridostigmine: tolerance to carbamates.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 978; 1977.

Effects of chronic administration of pyridostigmine were studied at the neuromuscular junction. Single daily i.p. injections of pyridostigmine bromide (1 mg/kg) or saline control solution were administered to rats for 5-10 days. Rats were sacrificed 24 hours after the last injection and the phrenic nerve-diaphragm was removed. Dose-response curves for the effect of pyridostigmine on the contraction responses to repetitive indirect stimulation were determined for nerve-diaphragm preparations. Pyridostigmine (at 0.1 to 100 μM) produced a dose-dependent decrease in contraction amplitude. The response to pyridostigmine was significantly less in the chronically-treated preparations than in the control preparations. Muscle acetylcholinesterase (AChE) activity was measured by the spectrophotometric method of Ellman. The enzyme activity of diaphragms from chronically treated rats was not significantly different from control. Also, when pyridostigmine was added, the percent inhibition of muscle AChE was not significantly different in control and treated diaphragms. The results indicate that tolerance to pyridostigmine can be demonstrated in the nerve-diaphragm preparation taken from chronically treated animals; this tolerance is not associated with an increase in muscle AChE activity. (Author abstract by permission) (Abstract No. 3737)

77-1300. Deckert, F. W.; Moss, J. N.; Sambuca, A. S.; Seicel, M. C.; Steigerwalt, R. B. (Rohm and Haas Co. Res. Lab., Spring House, PA 19477). **Nutritional and drug interactions with Vacor rodenticide in rats.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 990; 1977.

Vacor (*N*-3-pyridylmethyl- *N'*-*p*-nitrophenyl urea) is a species-selective single-dose rodenticide. Mode of action studies suggest nicotinamide antagonism. The antidotal efficacy of nicotinamide (p.o. or i.p.) was greatest when administered within 1 hr of Vacor, or when pre-fed in diet. Nicontinic acid was less effective. Rats fed high levels of L-tryptophan or acutely pretreated were protected against Vacor, while D-tryp. and other amino acids were less effective. Agents such as atropine, PAM or nikethamide delayed but did not prevent death. Vacor or 2,4-DNP caused similar symptoms, suggesting interference with mitochondrial respiration. While mild Vacor-induced hyperglycemia was seen in rats and reversed by insulin, its role in ultrimate toxicity is unclear. Vacor biotransformation appears to be more significant in detoxication, but prior bioactivation was not necessarily excluded. Cyt. P-448 induction by 3-MC pretreatment decreased Vacor toxicity 50-fold, while other classes of MFO inducers (PB, DMSO, PCN) did not significantly alter its potency. Reduction of P-450 complex activity by starvation or CS^2 pretreatment potentiated the toxicity, but SKF-525A delayed death. Pretreatment with diethyl maleate, cobaltous chloride, or neomycin did not significantly alter Vacor toxicity. Further biochemical-pharmacological studies are in progress to clarify the mechanisms of action and metabolic fate of Vacor. (Author abstract by permission) (Abstract No. 3799)

77-1301. Miller, A. III.; Henderson, M. A.; Buhler, D. R. (Oregon State Univ., Corvallis, OR 97331). **Binding of carbaryl (1-naphthyl *N*-methyl carbamate) to rat tissue proteins in vivo in vitro.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 996; 1977.

Appreciable amounts of radiocarbon from ^{14}C-methyl and ^{14}C-ring labeled carbaryl were still bound in the rat to proteins of the liver, kidney, muscle, and in particular, the small intestine following denaturation and exhaustive extraction. A majority of the liver radioactivity was bound to proteins in the endoplasmic reticulum and the cell cytosol while lesser amounts were associated with those of the nucleus and mitochondria. *In vitro* binding of ^{14}C-ring labeled carbaryl to hepatic microsomes occurred in the presence of NADPH and 0_2 and was inhibited by N_2, CO, reduced glutathione, cysteine, *N*-ethyl maleimide, and 2-diethylaminoethyl -2,2- diphenylvalerate HCl (SKF 525-A). Binding was markedly increased, 2- to 3-fold, by pretreatment of animals with phenobarbital (20 mg/kg, i.p. daily for 3 days) and 3-methylcholanthrene (20 mg/kg, i.p. daily for 2 days) and appeared to be dependent on the production of an active metabolite which was found oxidatively in liver microsomes by a cytochrome P-450 mixed-function oxidase. The distribution of radioactivity after Pronase digestion, treatment with 1-fluoro- 2,4-dinitrobenzene, and extraction with ethyl acetate and ethyl ether at pH 9 and 1 indicated that the radiolabeled products were covalently bound to amino acid residues of microsomal protein. (Author abstract by permission) (Abstract No. 3828)

77-1302. Talcott, R. E.; Shu, H.; Wei, E. T. (Sch. Pub. Health, Univ. California, Berkeley, CA 74720). **Lipid peroxidation and paraquat toxicity.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 998; 1977.

Lipid peroxidation has been proposed as a mechanism underlying paraquat lung toxicity. In this investigation this hypothesis was critically examined. Paraquat and diquat, incubated with liver microsomes and appropriate cofactors, stimulated superoxide, hydrogen peroxide, and lipid peroxide production, 2 fold, 6 fold, and 2 fold respectively. Concentration-dependence studies were done to determine the half-maximal stimulatory concentrations of paraquat and diquat. The results of these studies show that diquat, on a molar basis, is a more potent stimulator than paraquat. With diquat as the electron acceptor it was possible to dissociate superoxide production from lipod peroxide stimulation. Therefore, initiation of microsomal lipid peroxidation may be independent of oxygen reduction. Consistent with this suggestion, neither superoxide dismutase nor catalase inhibited the paraquat-stimulated rate of lipid peroxidation. In lung microsomes, both paraquat and diquat stimulation lipid peroxidation 3 to 5 fold. The half-maximal stimulatory concentrations were 80 μM for paraquat and 6 μM for diquat. In mice treated with *N,N'*-diphenyl *-p-* phenylenediamine (DDPD) or fed a fat-free diet, paraquat stimulation of lung microsomal lipid peroxidation was virtually abolished. However, in spite of this resistance to peroxidation, pretreated mice were not significantly resistant to the lethal effects of paraquat. (Author abstract by permission) (Abstract No. 3834)

77-1303. Budy. A. M.; Rashad. M. N.; Mi. M. P. (Univ. Hawaii. Pacific Biomed. Res. Ctr.. Honolulu. HI 96816). **Effects of pesticide residues on blood pressure.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 1008; 1977.

Hypertension is fairly common in the general population of Hawaii but its prevalence varies among ethnic groups. In a population sample of 10.951 subjects attending the health appraisal center at the Pacific Health Res. Inst. the mean blood pressure was 134.7/82.1 ± 24.3/17.5 and the mean cholesterol level was 227.2 ± 39 mg%. A subset of 3.041 blood pesticide residue levels was used for linear regression analysis of the data. Mean pesticide residue values ± SD (in ppb) were: 5 ± 5.0 for *p,p'*-DDT; 25.2 ± 22.0 for *p,p'*-DDE; 2.3 significant hazards to human intrauterine development. An exception to the latter generalization is methylmercury which. because of peculiarities in distribution. can reach high concentration in the human diet. (Author abstract by permission)

77-1304. Cabral, J. R. P.; Shubik, P. (Eppley Inst. Res. Cancer, Univ. Nebraska Med. Ctr., Omaha, NB 68105). **Lack of carcinogenicity of DDT in hamsters.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(3): 1086; 1977.

Experimental studies on the possible carcinogenicity of DDT in mice have indicated a marked increase in liver tumors following life long exposure. Results of long-term studies of DDT in rats have revealed a borderline carcinogenic effect. The present experiment seeks to determine whether or not DDT increases tumor incidence in hamsters and to establish dose-response relationships. Groups of 30 female and 30 male Syrian golden hamsters were given DDT mixed into the diet at the dose levels of 125 parts per million (ppm), 250 ppm and 500 ppm for the life span. A control group was also provided. Growth and survival rates were similar in experimental and control animals. The exposure to DDT did not significantly increase the percentage of tumor-bearing animals in the several groups. The average number of tumors per exposed hamster and the percentage of hamsters with more than one tumor were not influenced by treatment. The present findings do not demonstrate any carcinogenic activity of DDT in hamsters. (Author abstract by permission) (Abstract No. 4303)

77-1305. Wilson, J. G. (Childrens Hosp. Res. Fdn., Univ. Cincinnati Coll. Med., Cincinnati, OH 45229). **Teratogenic effects of environmental chemicals.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(5): 1697-1703; 1977. (28 references)

Despite the widespread distribution of a great many chemical substances in the environment, very few have been implicated in human teratogenicity, and most of these are drugs used at relatively high biological effect levels. Although several other types of environmental chemicals such as pesticides, solvents, and metals can be shown under laboratory conditions to have some teratogenic potential, there is little evidence that these, at present ambient concentrations and conditions of exposure, represent significant hazards to human intrauterine development. An exception to the latter generalization is methylmercury which, because of peculiarities in distribution, can reach high concentration in the human diet. (Author abstract by permission)

77-1306. McLean, A. E. M. (Dep. Exp. Pathol., Univ. Coll. Hosp. Med. Sch., London WC1E 6JJ, England).

Diet, DDT, and the toxicity of drugs and chemicals. *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(5): 1672, 1688-1688-1691; 1977. (45 references)

The toxic and carcinogenic effects of many compounds depend on their activation to reactive molecules in the cytochrome P-450 system of the endoplasmic reticulum of cells. Changes in dietary input alter P-450 levels in different tissues and so alter toxicity. In this way, low protein diets protect against carbon tetrachloride poisoning. Fats, proteins, and nonutrients such as flavones, antioxidants, and contaminants like DDT all affect P-450 levels. The achivated molecules may be diverted from their sites by inactivation processes, such as epoxide hydratase or glutathione trapping. This is also under nutritional control. Low protein diets render animals sensitive to acetaminophen by reducing glutathione trapping. In the sequence of events leading from initial contact of toxin with organism to eventual cell injury or neoplasm, nutritional factors are of import at every stage. Assessments of the toxicity of chemicals that do not take into account the nutritional variable in man are likely to be incorrect. (Author abstract by permission)

77-1307. Witschi, H. (Dep. Pharmacol., Fac. Med., Univ. Montreal, Montreal, Quebec, Canade). **Environmental agents altering lung biochemistry.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(5): 1629, 1631-1634; 1977. (63 references)

Environmental agents may enter the lung via the tracheobronchial tree or via the bloodstream. They can interact with lung cell metabolism and set in motion a sequence of events that leads to damage, adaptation, and repair. Biochemical signs of lung damage described include lipid peroxidation, decreased biosynthesis of macromolecules, depressed enzyme activities, and the binding of metabolites of the offending agent to tissue macromolecules. As a response to acute damage, lung can activate several biochemical pathways. The selenium-glutathione peroxidase system affords protection against lipid peroxidation and increased activity of superoxide dismutase provides oxygen tolerance. Biochemical adaptation occasionally occurs very quickly: the herbicides paraquat and diquat produce an acute loss of cellular NADPH in lung. This is accompanied by a sudden increase in pentose phosphate pathway activity. Biochemical events accompanying tissue repair following lung injury are increased synthesis of nucleic acids and of protein and enhanced enzymatic activity. The repair following lung damage caused by drugs may be inhibited by oxygen. (Author abstract by permission)

77-1308. Conney, A. H.; Pantuck, E. J.; Hsiao, K. C.; Kuntzman, R.; Alvares, A. P.; Kappas, A. (Dep. Biochem. Drug. Metabo., Hoffmann-La Roche Inc., Nutley, NJ 07110). **Regulation of drug metabolism in man by environmental chemicals and diet.** *Fed. Proc. Fed. Am. Soc. Exp. Biol.* 36(5): 1629, 1647-1652; 1977. (65 references)

Studies in animals have shown that many environmental pollutants induce the synthesis or inhibit the activity of microsomal mixed-function oxygenases that metabolize drugs, carcinogens and normal body constituents such as steroid hormones. These effects on microsomal enzyme activity alter the duration and intensity of action of foreign and endogenous chemicals in animals, and such effects on metabolism may influence the carcinogenicity of some pollutants in man. Studies on the effects of environmental chemicals on drug metabolism in man are sparse. Exposure of humans to DDT or lindane in a pesticide factory results in an enhanced rate of metabolism of antipyrine and phenylbutazone and an increased urinary excretion of 6-β-hydroxycortisol. Polycyclic aromatic hydrocarbons present in cigarette smoke, in charcoal-broiled meats, and in polluted city air are potent inducers of drug-metabolizing enzymes in animals. In humans, cigarette smoking stimulates the activity of placental enzymes that metabolize several drugs and carcinogens. In addition, cigarette smokers metabolize phenacetin, theophylline, and other drugs more rapidly in vivo than nonsmokers. Dietary factors are important in the regulation of drug metabolism in animals and man. Feeding rats brussels sprouts or cabbage stimulates the intestinal and hepatic metabolism of drugs in animals. This effect is caused, at least in part, by certain indoles normally present in these vegetables. The feeding of a charcoal-broiled beef diet to rats stimulates the metabolism of phenacetin in vitro, and a similar diet stimulates the in vivo metabolism of phenacetin in man. It is likely that polycyclic aromatic hydrocarbons are the major inducers in charcoal-broiled beef. (Author abstract by permission)

77-1309. Broda, C.; Nachtomi, E.; Alumot, E. (Inst. Anim. Sci., Agric. Res. Org., Volcani Ctr., Rehovot, Israel). **Differences in liver morphology between rats and chicks treated with ethylene dibromide.** *Gen. Pharmacol.* 7(5): 345-348; 1976. (13 references)

Morphological changes were found in livers of rats and chicks after acute poisoning with ethylene dibromide (EDB). In rats, EDB induced sinusoidal dilations and centrilobular necrosis, beginning from 8 hr after poisoning. In chicks the central areas were almost unchanged and portal areas were found to be affected by EDB; the concentration of eosinophilic granulocytes was much greater in EDB-treated livers than in controls. (Author abstract by permission)

77-1310. Mehhendale, H. M.; Takanaka, A.; Desaiah, D.; Ho, I. K. (Dep. Pharmacol. Toxicol., Univ. Mississippi Med. Ctr., Jackson, MS 39216). **Kepone induction of hepatic mixed function oxidases.** *Life Sci.* 20(6): 991-998; 1977. (27 references)

Effect of preexposure to kepone on hepatic drug metabolizing enzymes and several parameters of mixed function oxidase (MFO) system was investigated. Male rats were exposed to 0, 50, 100 and 150 ppm kepone in the daily ration for 16 days. Gain in body weight was reduced after kepone to 86, 62 and 33% of controls for 50, 100 and 150 ppm kepone. While hydroxylation of both aniline and pentobarbital was enhanced, the increases in aliphatic hydroxylation (i.e., pentobarbital) were greater at all levels of exposure to kepone. Aminopyrine demethylase was enhanced roughly 3 fold at 50 kepone and was not further increased at higher levels of kepone. Cytochrome P450, NADPH-cytochrome c reductase, and aniline binding were all increased suggesting that there were general increases with intermediate steps of the electron transfer and drug oxidation system. Cytochrome b_5 and NADPH dehydrogenase were unaltered after kepone treatment. These results suggest that kepone is an efficient inducer of hepatic MFO system. (Author abstract by permission)

77-1311. Seiler, J. P. (Swiss Fed. Res., Stn., CH-8820 Waedenswil, Switzerland). **Nitrosation in vitro and in vivo by sodium nitrite, and mutagenicity of nitrogenous pesticides.** *Mutat. Res.* 48(2): 225-226; 1977. (32 references)

Thirty-seven nitrogenous pesticides, belonging to the chemical groups of amides, carbamates and ureas, were nitrosated with sodium nitrite in vitro. The nitrosated compounds were tested for mutagenic activity in the bacterial spot test with *Salmonella typhimurium* his G 46. Those pesticides reacting positively in this test after nitrosation were then fed to mice in combination with sodium nitrite in order to assess the formation and mutagenicity of these nitroso compounds in vivo. With the already known exception of ethylenethiourea (ETU), no pesticide produced enhanced numbers of micronuclei in mouse bone-marrow erythrocytes when fed together with nitrite. Dose-response experiments with intraperitoneal injection of *N*-nitroso-ETU revealed an apparent no-effect level of about 15-18 mg/kg. The findings are correlated with the pesticide residues actually present in the environment. (Author abstract by permission)

77-1312. Shahin, M. M.; Von Borstel, R. C. (Dep. Genet., Univ. Alberta, Edmonton, Alberta T6G 2E9, Canada). **Mutagenic and lethal effects of α-benzene hexachloride, dibutyl phthalate and trichloroethylene in *Saccharomyces cerevisiae*.** *Mutat. Res.* 48(2): 173-180; 1977. (8 references)

Saccharomyces cerevisiae strain XV185-14C for reversion studies was used to investigate the genetic activity of α-benzene hexachloride (α-BHC), dibutyl phthalate and trichloroethylene. The results indicate that none of the three compounds was genetically active when yeast cells were treated in phosphate buffer (pH 7.0) in the absence of metabolic conversion. However, in the presence of the 9000 *g* supernatant of mice liver homogenate, NADPH, glucose-6-phosphate, phosphate buffer (pH 7.4), $MgCl_2$, KCl, the components which were used for the metabolic conversion, trichloroethylene proved to be a powerful mutagen. It increases the frequency of homoserine, histidine and lysine revertants over those of the control levels. Trichloroethylene appears to induce frameshift as well as base substitution mutations. (Author abstract by permission)

77-1313. Azevedo, J. L.; Santana, E. V.; Bonatelli, R. (Genet. Microbiol. Sec., Inst. Genet., Piracicaba, Sao Paulo, Brazil). **Resistance and mitotic instability to chloroneb and 1,4-oxathiin in *Aspergillus nidulans*.** *Mutat. Res.* 48(2): 163-172; 1977. (49 references)

Mutants resistant to two fungicides, chloroneb (1,4-dichloro- 2,5-dimethoxy- benzene) and vitavax (2,3-dihydro- 5-carboxanilido- 6-methyl- 1,4-oxathiin, carboxin) were spontaneously obtained from a strain of *Aspergillus nidulans* with frequencies of 12.5 and 1.1, respectively, in 10^8 conidia. One chloroneb-resistant mutant (*Chl 1*) segregated as a single gene and was mapped in linkage group IV. It also caused a partial dependence of the strain on the fungicide and was semidominant. The mutant resistant to vitavax (*Vit 1*) also segregated as a single gene and was dominant. Both fungicides altered the instability of diploid and suplication strains. Chloroneb mainly increased haploidization, and vitavax reduced the mitotic recombination in diploids. Chloroneb increased the instability of diplication strains, and vitavax reduced such instability. The possible mode of action of such fungicides affecting stability is discussed. (Author abstract by permission)

77-1314. Kekki, M.; Julkunen, R. J. K.; Wahlstroem, B. (Dep. Pharmacol., Univ. Helsinki, Helsinki, Finland). **Distribution pharmacokinetics of warfarin in the rat, a non-linear mucltcompartment model.** *Naunyn-Schmiedeberg's Arch. Pharmacol.* 297(1): 61-73; 1977. (32 references)

Preliminary analysis and linear two-compartment solutions of warfarin plasma concentrations recorded in the rat after intravenous bolus injections of 1, 2, 8 and 40 mg/kg of sodium warfarin revealed marked nonlinearities. The half-life of total warfarin concentration in the plasma from 1-12 h remained unchanged with all the doses used, but that of free warfarin was shorter with 40 mg/kg, possibly as the result of an increase in the binding of the drug to plasma proteins as the high total warfarin concentration decreased. The apparent volume of distribution generally increased with in-

creasing dose, and differed according to the method used for its calculation. Liver warfarin data could be solved with Langmiur type saturation kinetics, but the saturation phenomena were slight in the concentration range studied. A non-linear multicompartment model was constructed, the physiological spaces of which were plasma, interstitial fluid and tissue. According to the best fits, warfarin is preferentially distributed into plasma, interstitial fluid and highly perfused tissues. (Author abstract by permission, abridged)

77-1315. Clifford, D. R.; Hislop, E. C.; Shellis, C. (Long Ashton Res. Stn., Univ. Bristol, Brisol BS18 9AF, England). **Effects of fungal and plant esterases on the fungicidal activity of nitrophenol esters.** *Pestic. Sci.* 8(1): 13-22; 1977. (34 references)

Aryl esterases, present within leaves and fungal spores and on their surfaces, hydrolyzed 2-naphthyl, 4-nitrophenyl and 4-(1-substituted alkyl) -2,6- dinitrophenyl esters at rates which appeared to be determined by the nature of the ester group and by the alkyl substituents in the molecule. No simple relationship was found between partitioning (as measured by *Rm* values from reverse-phase t.l.c.) and susceptibility to hydrolysis by esterases. The most readily hydrolyzed alkyldinitrophenyl esters are not those derived from parent nitrophenols with the greatest fungitoxicity *in vitro* or *in vivo*, and the highly active 4-(1-cyclobutylakyl) -2,6-dinitrophenyl dinitrophenyl crotonates are among the least easily hydrolyzed. It is suggested that alkyldinitrophenyl esters may have their own mode of action as powdery mildew fungicides which complements, and may even supplant, that resulting from hydrolysis to the parent alkyldinitrophenol. The proposed mechanism is disruption of the fungal cell membrane (as a result of surfactant properties) leading to leakage of essential cell components. (Author abstract by permission)

77-1316. Rouchaud, J. P.; Lhoest, G. J.; Mercier, J. J.; Meyer, J. A. (Univ. Cathol. Louvain, Lab. Phytopathol., Louvain, Belgium). **Metabolism of benomyl in carrot, strawberry and apple.** *Pestic. Sci.* 8(1): 23-30; 1977. (7 references)

The metabolism of benomyl was studied in carrots treated with high rates of benomyl, and in strawberries and apples treated at normal rates. The same metabolites were observed in both cases though, at normal rates, their concentrations were low but significant. Detected by means of gas-liquid chromatography they were: carbendazim, 2-aminobenzimidazole (2-AB), benzimidazole, 2-aminobenzonitrile, *o*-phenylenediamine and the conjugates of carbendazim and 2-AB. *o*-Phenylenediamine has not hitherto been reported as a metabolite of benomyl. Two unidentified compounds were also observed by gas-liquid chromatography; their mass spectra were obtained by means of combined gas-liquid chromatography and mass spectrometry. (Author abstract by permission)

77-1317. Rouchaud, J. P.; Decallonne, J. R.; Meyer, J. A. (Univ. Cathol. Louvain, Lab. Phytopathol., Louvain, Belgium). **Metabolism of 2-aminobenzimidazole and benzimidazole in melon plants.** *Pestic. Sci.* 8(1): 31-34; 1977. (4 references)

Melon plants grown in a liquid nutrient solution were separately treated either with benomyl, 2-aminobenzimidazole (2-AB), or benzimidazole (BZ), and after 60 days each compound had decomposed into significant concentrations of metabolites, those from 2-AB and BZ corresponding to the metabolites from benomyl. This supported the following postulated metabolic pathway for benomyl in melon plants: benomyl to carbendazim to 2-AB to BZ. Involvement of the other identified metabolites of benomyl (2-aminobenzonitrole, *o*-phenylenediamine, aniline, and the conjugates of carbendazim and 2-AB) cannot be proposed unequivocally. In the extracts from plants treated with 2-AB or BZ, new and unidentified metabolites have also been observed using gas-liquid chromatography (g.l.c.). (Author abstract by permission)

77-1318. Warrander, A.; Waring, R. H. (Dep. Biochem., Univ. Birmingham, PO Box 363, Birmingham B15 2TT, England). **The metabolism of mebenil in rats, rabbits and guinea pigs.** *Pestic. Sci.* 8(1): 54-58; 1977. (18 references)

The metabolism of mebenil (*o*-toluanilide) was studied in rats, rabbits and guinea-pigs. The major metabolite in all three species was 4′-hydroxy-*o*-toluanilide, both free and as glucuronide and sulphate conjugates. Traces of aniline were also excreted, showing that the amide bond was hydrolyzed *in vivo*. (Author abstract by permission)

77-1319. Rouchaud, J. P.; Decallonne, J. R.; Meyer, J. A. (Univ. Cathol. Louvain, Lab. Phytopathol., Louvain, Belgium). **Metabolism of the fungicide triforine in barley plants.** *Pestic. Sci.* 8(1): 65-70; 1977. (13 references)

The metabolic fate of [^{3}H]-triforine in barley plants has been studied. At 15 and 30 days after treatment, unchanged triforine amounted to 57.5 and 43.2% respectively, and of three soluble metabolites detected, piperazine (0.3 and 4.0%) and *N*-[2.2.2-trichloro -1-(piperazin-1-yl)ethyl] formamide (12.9 and 8.4%), the latter for the first time as a metabolite in plants, were identified using t.l.c. with four solvent systems. The solid residue contained 21.1 and 38.2% of bound label after 15 and 30 days respectively. (Author abstract by permission)

77-1320. Sanborn, J. R.; Metcalf, R. L.; Hansen, L. G. (Illinois Nat. Hist. Survey, Illinois Agric. Exper. Stn., Urbana, IL 61801). **The neurotoxicity of *O*-(2,5-dichlorophenyl) *O*-methyl phenylphosphonothioate, an impurity and photoproduct of leptophos (phosvel) insecticide.** *Pestic. Biochem. Physiol.* 7(2): 142-145; 1977. (8 references)

The neurotoxic effects of leptophos and three degradation products of leptophos have been evaluated in white leghorn pullets. The data derived demonstrate that desbromo leptophos and leptophos oxon are approximately three and two times, respectively, more effective neurotoxic agents than leptophos in the white leghorn pullet.

77-1321. Krueger, H. R. (Dep. Entomol., Ohio Agric. Res. Develop. Ctr., Wooster, OH 44691). **Aldicarb sulfoxidation by plant root extracts.** *Pestic. Biochem. Physiol.* 7(2): 154-160; 1977. (17 references)

Soybean root homogenates were found to oxidize aldicarb to aldicarb sulfoxide. Fractionation of soybean root homogenate indicates that the enzyme(s) which oxidize aldicarb to the sulfoxide are largely (63%) in the 25,000 *g* supernatant. *In vitro* studies of the 25,000 *g* supernatant showed a linear reaction rate at 24 and 34°C for periods of up to 2 and 1 hr, respectively, at the pH optimum of 5.5. Bean and soybean root 25,000 *g* supernatants were the most active on a per milligram of protein basis followed by corn, sorghum, barley, and tomato (8-27 nmol/mg of protein/hr). A 140-fold purification of soybean root aldicarb sulfoxidase was achieved. *In vitro* studies indicated that methomyl, methiocarb, phorate, Counter, fensulfothion, fenthion, Nemacur, EPTC, vernolate, carboxin, DL-methionine, L-cysteine, L-methionyl-L-serine, thiodiglycolic acid, lipoic acid, thiourea, and thioacetic acid when present at a 10:1 ratio with aldicarb significantly inhibited soybean root aldicarb sulfoxidation.

77-1322. Civen, M.; Lifrak, E.; Brown, C. B. (Med. Res. Prog., Vet. Admin. Hosp., Long Beach, CA 90822). **Studies on the mechanism of inhibition of adrenal steroidogenesis by organophosphate and carbamate compounds.** *Pestic. Biochem. Physiol.* 7(2): 169-182; 1977. (22 references)

The observation was made that adrenal steroidogenesis in rat adrenal cells is inhibited *in vitro* by organophosphate and phosphorothioate esters and carbamates. The order of inhibitory potency is organophosphate >> phosphorothioate > carbamate. The inhibition of steroidogenesis by dichlorvos is accompanied by a parallel inhibition of [1-^{14}C]oleic acid incorporation into the esterified cholesterol fraction of the adrenal cell. At a lower concentration of the inhibitor, adrenocorticotrophic hormone reverses the inhibition of cholesterol esterification. There is no correlation between changes in adenosine 3′,5′-cyclic monophosphate levels and inhibition of steroidogenesis. One insecticide, diazinon, produced a lowering of the cyclic nucleotide levels at concentrations of the compound which produced steroidogenic inhibition. Subinhibitory levels of this insecticide produced a significant elevation of cellular adenosine 3′,5′-cyclic monophosphate levels and yet inhibited steroidogenesis. Both of these insecticides inhibited adenosine 3′,5′-cyclic monophosphate binding to rat adrenal adenosine 3′,5′-cyclic monophosphate-binding protein. Dichlorvos inhibited the diurnal increase in plasma corticosteroid by 49.2% when administered to rats at a dose of 2 mg/100 g body weight/24 hr for a 2-week period. (Author abstract by permission)

77-1323. Edwards, J. P.; Rowlands, D. G. (Min. Agric. Fish. Food, Pest Infest. Contr. Lab., Slough, Berkshire, England). **Metabolism of a synthetic insect juvenile hormone (JH-1) during the development of *Tribolium castaneum* (Herbst) (Coleoptera, Tenebrionidae).** *Pestic. Biochem. Physiol.* 7(2): 194-201; 1977. (19 references)

Metabolites produced from ^{14}C-labeled C-18 juvenile hormone (JH-1) topically applied to the flour beetle *Tribolium castaneum* were measured in larvae aged 21 and 28 days, pupae at four stages of development, and newly emerged and mature adults. The hormone was metabolized rapidly, in all stages examined, to form the corresponding diol-ester, acid-epoxide, and acid-diol derivatives, the diol-ester derivative being the major metabolite produced. The metabolism of JH-1 was most rapid at the times of the larval/pupal and pupal/adult transformations. The differences in the rate of metabolism appeared to be correlated with changes in the production of the diol-ester derivative. Similar metabolic changes may regulate the levels of endogenous juvenile hormones during development in this species. (Author abstract by permission)

77-1324. Gavat, V.; Alexa, L.; Melinte, C. (Dep. Gen. Hyg., Inst. Med., Iasi, Romania). **Cercetari cu privire la reactivatatea imunobiologica ca indicator de apreciere a perturbarii interrelatiilor organism-mediu.** [**Studies on immunobiologic reactivity as an indicator for evaluating disturbances in the balance between the organism and the environment.**] *Igiena* 25(4): 307-311; 1976. (19 references) (Romanian)

Immunologic and biochemical indices were assessed in rats and rabbits given trichlorfon or carbetox at 1/20-1/200 LD50 or BHC at 6 or 0.6 mg/kg. Indices studied were phagocytic activity of the blood neutrophils, serum lysozyme, bactericidal capacity of the blood, antibody production, total serum proteins, protein fractions, SGOT, SGPT, tissue respiration in brain and liver, and ratio of body weight to liver weight. The overall bactericidal capacity of the blood was particularly responsive to low pesticide doses. Antibody production was altered only after administration of large pesticide doses. The organochlorine (BHC) influenced the biochemical indices even at the lowest dosage, while both of the organophos-

phates caused significant modifications of the brain tissue respiration. The immunobiological indicators were more sensitive than the biochemical factors.

77-1325. Leek, K. P.; Trochmiowicz, H. J.; Sarver, J. W. (Haskell Lab. Toxicol. Indust. Med., E. I. DuPont De Nemours and Co. Inc., Wilmington, DE 19898). **Induction of nasal tumors in rats exposed to hexamethylphosphoramide (HMPA).** *Lab. Invest.* 36(3): 344-345; 1977.

In an inhalation study groups of Charles River-CD rats (male and female) were exposed to 10-4000 ppb of hempa for 6 hours per day, five days a week, for one year. Nasal tumors were first detected after 6-7 mo of exposure at the 400 and 400 ppb levels, 9 mo at the 100 ppb level, and 13 mo at the 50 ppb level. The nasal tumors were mostly squamous cell carcinomas, and less frequently squamoadenocarcinoma or nasal papilloma. Metastases of some of the nasal tumors were seen to the cervical lymph nodes of lungs, and in some cases the tumors grew directly into the cerebrum. The group of rats at the lowest dose level, 10 ppb, had no developed nasal tumors after one year. Light and electron microscopic examinations revealed rhinitis and squamous metaplasia with keratinization in both the nasal turbinate epithelium and acinar epithelium of the nasal glands. Necrosis of the tracheobronchial epithelium and enhanced murine pneumonia were also seen.

77-1326. Sosnierz, M.; Kita, K.; Szczurek, Z.; Kita, I. (Dep. Cytodiagnost., Inst. Patol., Acad. Med., Katowice, Poland). **Skrocone zatrucie przewlekle szczurow pestycydem IPO-1250. [Intoxication with the pesticide IPO-1250 in rats.]** *Med. Pr.* 28(1): 7-13; 1977. (12 references) (Polish)

Rats were fed diet containing IPO-1250 (carbendazim) at 50, 200, 800, and 4000 ppm for 90 days, then killed and examined. The relative organ and brain weights were determined and the brain segments were examined. IPO-1250 was concluded to affect metabolic processes in rats, decreasing or increasing the relative weights of the internal organs. Nonspecific and generally reversible changes were observed in the organs, in the form of circulatory disturbances and regressive changes. The intensity of changes typically increased at the highest pesticide dose administered, 4000 ppm. The maximum tolerable dose of IPO-1250 in the rat is 800 ppm.

77-1327. Biczowa, B.; Sikorska, M.; Zalewska, Z.; Bicz, W. (Dep. Drug. Metab., Inst. Biopharm., Acad. Med., Warsaw, Poland). **Effect of a thiophosphoric insecticide -- fenchlorphos on the glycogen level, glycolysis and glucose-6-phosphate dehydrogenase activity in rat brain.** *Neuropatol. Pol.* 14(3): 384-388; 1976. (19 references)

Rats were given fenchlorphos per os in oil at 2%, 5%, 10%, or 50% LD50 in a single dose or for 14 successive days at 2%, 5%, or 10% LD50 per day. The rats were decapitated and examined 2 or 24 hr after the last administration, and glycogen was determined in the cerebral hemispheres. A statistically significant decrease in glycogen levels was found in brains of rats examined 2 hr after administration of fenchlorphos at 50% LD50; the 10% LD50 dose produced about a 17% decrease, while 2% LD50 had no effect. The brain glycogen levels were equal to those of controls 24 hr after administration of all doses. With the exception of increased lactic acid production observed 24 hr after a single administration of 10% LD50 no other difference in glycolysis (glucose consumption or lactate production) was noted in comparison to the controls. Glucose-6-phosphate dehydrogenase activity remained unchanged after single administration of 2%, 2% or 50% LD50 doses as well as after repeated administration of 2% and 5% LD50 per day.

77-1328. Korotkova, L. P.; Khafizov, G. G.; Yanbukhtina, F. A.; Sunargulov, T. S. (Ufim Scientific-Res. Inst. Dis. Eye, Bashkir Med. Inst., USSR). **K voprosu o sostoyanii organa zreniya pri vozdeistvii nekotorykh fosforoorganicheskikh soedinenii v usloviyakh khronicheskogo eksperimenta. [The status of the eye under the influence of some organophosphorus compounds: chronic experiment.]** *Oftal'mol. Zh.* 31(5): 379-381; 1976. (3 references) (Russian)

Effects of trichlorfon (0.01-1%), armine (0.01%) and phosphacol (1:7500) solutions on the vascular permeability were examined in the anterior segment of white rat eyes using a visual-comparative fluorometry method. These compounds, other than 0.01% trichlorfon, increased the permeability for fluorescein-protein complex. Bilateral and prolonged entry of fluorescein into the anterior chamber was seen with trichlorfon, while the curve of dye concentration in the anterior chamber dropped off sharply in the case of armine and phosphacol. Widening and blood filling of the ciliary capillaries were seen on pathohistological studies of enucleated eyes of experimental animals. These reactions are probably due to mast cell reactions. The posterior ciliary arteries were narrowed, the capillary blood supply of the retina was disturbed, and the choroidal veins were widened.

77-1329. Dobbertin, S. (Umweltbundesamt, Berlin, West Germany). **Gesundheitsgefahrdende Organochloroverbindungen. [Toxicity of organochlorine compounds.]** *Tieraerztliche Umschau* 31(1): 27-30; 1975. (57 references) (German)

Studies on the toxicity of organochlorine pesticides and PCBs are reviewed. These substances accumulate principally in fat due to their lipophilic nature. They cause reversible hepatomegaly with proliferation of the endoplasmatic reticulum. Enlargement of the kidneys, spleen, and thyroid gland due to DDT was also observed. Organochlorine insecticides reduce the glutamate-pyruvate transminase activity and increase the activity of the mixed function oxidase enzyme system. Hepatocellular tumors

were induced by DDT in mice. Organochlorine pesticides represent a carcinogenic hazard for humans, even though there are no epidemiological data on humans. High toxic doses of dieldrin, aldrin, and endrin had teratogenic effects in hamsters and mice.

77-1330. Witschi, H. (Dep. Pharmacol., Fac. Med., Univ. Montreal, Montreal, Quebec, Canada). **Proliferation of type II alveolar cells: a review of common responses to toxic lung injury.** *Toxicology* 5(3): 267-277; 1977. (118 references)

A review of the involvement of type II alveolar cells in toxic lung injury covers the topics of patterns of toxic lung injury, morphology and histochemistry of the type II alveolar cells, proliferation of type II alveolar cells in oxidant lung injury, toxic lung damage via other routes of administration, alveolar proteinosis as a side effect to drugs, biochemical events associated with tissue repair following toxic lung injury, and isolation of type II alveolar cells. It has now been established that type II alveolar cells function as stem cells of the alveolar epithelium. They have a highly active metabolism and are important in pulmonary surfactant metabolism. Studies in humans and experimental animals poisoned with paraquat by ingestion or injection have contributed to these studies.

77-1331. Georgieva, V. L.; Tsoneva, M. T. (Chair Med. Genet., Fac. Med., Med. Acad., Sofia, Bulgaria). **Vliyanie pestitsidov na kolichestvo i tip assotsiatsii akrotsentricheskikh khromozome v kul'tiviruemykh limfotsitakh cheloveka. [Effects of pesticides on the number and type of acrocentric chromosome associations in cultured human lymphocytes.]** *Tsitologiya* 18(12): 1490-1494; 1976. (28 references) (Russian)

The effects of the organophosphate pesticide diazinon, the organochlorine lindane, and the dithiocarbamate zineb on the associative activity of acrocentric chromosomes in human short-term lymphocyte cultures were studied. A correlation was established between the dose inhibiting cell proliferation and the decrease in associative activity of acrocentric chromosomes. The predominant effect following diazinon treatment is inhibition of activity in group D chromosomes. The number of cells which had undergone blastic transformation was reduced in both diazinon- and lindane-treated cultures, the latter to a lesser extent.

77-1332. Dubois, J. M.; Bergman, C. (Lab. Neurobiol., Ecole Normale Superieure, Paris Cedex 05, France). **Asymmetrical currents and sodium currents in Ranvier nodes exposed to DDT.** *Nature* 266(5604): 741-742; 1977. (8 references)

DDT is considered a useful tool for investigating electrical phenomena in nerve membranes, as it slows down the turning-off of the Na permeability of the nodal membrane without changing its rate of turning-on. The relaxation time constants of sodium current activation and the displacement current were examined on voltage clamped myelinated fibers of the frog (Ranvier nodes) flooded with DDT test solution following a control measurement. The effect of DDT on the sodium current were in good agreement with those previously recorded. After exposure to DDT two exponential components can be distinguished in the displacement current off response: a fast one similar to that obtained from the control experiment and a second, markedly slower one. The second component was supposed to correspond to the fraction of charges affected by DDT, and amounted to about half of the transferred charges. The findings support the hypothesis that the displacement current reflects the movement of charges involved in the activation process of the Na conductance. It also appears that DDT acts only on charges previously displaced by depolarization and at the time of reversion to their resting state. The fraction of charges affected by DDT is greater than the fraction of affected channels; this is consistent with the assumption that at least two independent charges are involved in the gating subunit of each channel.

77-1333. Maier-Bode, H. (Rickenbach, Germany). **The insecticide "Kelevan".** *Residue Rev.* 63: 45-76; 1976. (36 references)

Kelevan, a reaction product of the insecticide Kepone (chlordecone) with ethyl levulinate, acts on insects primarily as a stomach poison. Kelevan is relatively not very toxic to warm-blooded animals. Its oral LD50 in corn oil or soybean oil is between 240 and 580 mg/kg in rats and dogs. In water suspension the value is several times greater. When added to the daily feed over the course of 90 days, Kelevan had a no-effect level of 300 ppm in rats, and between 20 and 100 ppm in dogs. The pattern of toxic effects in warm-blooded animals indicates that the central nervous system is the principal area of attack. The greater part of the ^{14}C administered to rats as a single dose of Kelevan is excreted via the liver with the bile into the intestine, and only small proportions through the kidneys. After many repeated daily oral applictions (a total of 10 mg/kg of Kelevan in 8 weeks), no accumulation of Kelevan or its metabolite Kepone could be determined analytically in the body fat, liver, or brain of rats. No indications could be found of carcinogenic or reproduction-inhibiting effects in the toxicological investigations of Kelevan, its formulations, and its metabolite Kepone. Kelevan is degraded relatively rapidly in the soil. Its half-life was determined as 6 and 12 weeks in 2 different soils in laboratory tests. In soil samples from 0 to 7.5 cm depths taken from various districts of the German Federal Republic, a maximum of 0.06 ppm Kelevan + Kepone was found 1, 3, and 6 months after control of the potato beetle with 150 or 300 g of Kelvan/ha. Kepone is a degradation product of Kelevan in the soil. "Kelevan acid" has been identified as another degradation product with an intact "cage structure". The end products of the degradation of Kelevan and Kepone were found to be CO_2 and HCl. (Author abstract by permission, abridged)

77-1334. Tu, C. M.; Miles, J. R. W. (Res. Inst., Agric. Canada, University Sub Post Office, London, Ontario, N6A 5B7, Canada). **Interactions between insecticides and soil microbes.** *Residue Rev.* 64: 17-65; 1976. (232 references)

Many insecticides have little effect on soil microorganisms under certain conditions. The toxicity of the chemicals may manifest itself in reduction of microbial growth rate, basic activity in metabolism and reproduction. Insecticides used at recommended field rates will not significantly reduce indigenous microbial activities that are important in soil fertility, and in some cases they are stimulatory. Excessive applications may be temporarily depressive. Certain microbes may become adapted to the chemicals. In a less competitive environment, by utilizing the dead cells of the organisms killed by the insecticide, they reach very high numbers. The population of organisms capable of degrading insecticides, therefore, increases dramatically as a result of insecticide application. The extent of the degradation depends on numerous factors. It appears that many microorganisms can metabolize the insecticides to some extent, but in some cases this limited metabolism leads to the production of even more toxic and persistent substances. Some organochlorine insecticides such as BHC, DDT, aldrin, heptachlor, dieldrin, toxaphene, and chlordane are highly resistant to degradation in soil and remain in the soil for long periods of time as residues. The addition of biodegradable organic material to the soil will enhance the growth of certain groups of microorganisms and influence insecticidal chemical reactions as a result of stimulated microbial activity and changes in soil aeration. Evidence shows that anaerobiosis of soil microorganisms stimulates the degradation of many insecticides. (Author abstract by permission, abridged)

77-1335. Willard, J. I.; Penner, D. (Dep. Crop Soil Sci., Michigan State Univ., East Lansing, MI 48824). **Benzoxazinones: cyclic hydroxamic acids found in plants.** *Residue Rev.* 64: 67-76; 1976. (66 references)

Benzoxazinones, cyclic hydroxamic acids found in plants as glucosides or the aglucone, have been related to plant-pest resistance. In the uninjured plant the benzoxazinones are found as glucosides; upon crushing or injuring the plant tissue the benzoxazinone aglucone is released as the result of cleavage of the *O*-glycosyl bond by β-glycosidases. These compounds have been shown to have antimicrobial properties. It has been well documented that the resistance in corn to the European corn borer is related to the concentration of the benzoxazinone present in the resistant lines. Detoxication of *s*-triazine herbicides in the roots of corn and other species has been by the conversion of the herbicides to their hydroxy derivative by the catalytic action of benzoxazinone. The total contribution of the benzoxazinones to herbicide selectivity has not been determined. Although a rapid and inexpensive assay for the quantitative determination of benzoxazinones content in plant tissue has not been developed, such a method presents great potential for the screening of many crop lines for resistance to several pest problems. (Author abstract by permission, abridged.)

77-1336. Schuphan, I. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanst., Berlin, West Germany). **Zum Metabolismus von Phenylharnstoff-Herbiziden. VI. Geschlossene Kultursysteme fuer die Bilanzierung radioaktiv markierter Pestizide nach Anwendung bei Kulturpflanzen.** [**Metabolism of phenylurea herbicides. 6. Closed culture systems for balance studies on radiolabeled pesticides applied to crops.**] *Chemosphere* 6(1): 5-10; 1977. (German)

A closed culture system consisting of a glass cylinder with water and air supply systems, carbon dioxide absorption system, and illumination was developed for balance studies and metabolic studies of radiolabeled phenylurea herbicides. Successful studies have been carried out with such closed systems on spinach, cress, potato, wheat, and sugar beet plants. The following recovery rates were determined: 95.9-96.2% for monolinuron, 89.1% for buturon, and 98.8% for diallate.

77-1337. Rozman, K.; Mueller, W.; Coulston, F.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH, Munich, Germany). **Long-term feeding study of hexachlorobenzene in rhesus monkeys.** *Chemosphere* 6(2-3): 81-84; 1977. (7 references)

Patterns of absorption and excretion of chronically administered hexachlorobenzene (HCB) in rhesus monkeys were examined to determine a possible plateau level of storage. Biological and biochemical parameters were also examined and compared with findings following a single dose. HCB was administered at 110 μg/day to three male and three female rhesus monkeys for 11-15 mo. An average of 50% of the radioactivity excreted in the urine was in the form of PCPh (pentachlorophenol), 25% as pentachlorobenzene, and the remaining 25% unidentified metabolites with varying amounts of HCB. In feces over 99% of the excreted radioactivity was HCB, less than 1% pentachlorobenzene, and traces of PCPh. The excretion and storage pattern of HCB in the rhesus monkey showed a very slow approach to a saturation level. During the last ten days of the experiment the males excreted 7.2% of the administered dose in the urine and 51.9% in the feces.

77-1338. Engelhardt, G.; Wallnoefer, P.; Fuchsbichler, G.; Baumeister, W. (Bayer. Landesanst. Bodenkult. Pflanzenbau, Abt. Pflanzenschutz, D-8000 Munich, Germany). **Bacterial transformations of 4-chloroaniline.** *Chemosphere* 6(2-3): 85-92; 1977. (18 references)

Four major modes transformation of halogenated anilines in soil and by microorganisms isolated from soil have been described. Transformation of 4-chloroaniline by different soil bacteria was examined to see which of these types of aniline transformation predominates. Soil incubated with radiolabeled 4-chloraniline metabolized the compounds; 9% of the ^{14}C was evolved as CO_2. Thirty-

three bacterial strains active in transforming 4-chloroaniline were isolated from this soil. Only the bacilli displayed high degrees of transformation of the aniline. A strain of *Bacillus firmus* was isolated for further study and transformed 2-chloroaniline almost quantitatively into 4-chloracetanilide with a smaller amount of 4-chloropropionanilide according to a cometabolic reaction. At higher chloroaniline concentrations the bacteria also released a yellow pigment, identified as a phenoxazinone.

77-1339. Ahmad, A.; Semeluk, G. P.; Unger, I. (Dep. Chem., Univ. New Brunswick, PO Box 4400, Fredericton, N.B. E3B 5A3, Canada). **Is ascorbic acid a general detoxifying agent?** *Chemosphere* 6(2-3): 129-132; 1977. (8 references)

Various studies have shown that ascorbic acid may function as a general detoxifying agent, preventing or alleviating the adverse effects of endogenous compounds and xenobiotics. Neutral and HCl-acidified ethanolic solutions of ascorbic acid were prepared at concentrations of 0.011 to 0.57 *M* and pesticides were added in molar ratios of 1:1-1:4, pesticide to ascorbic acid. Pesticides used were DDT, fenitrothion, meobal, matacil (aminocarb), and landrin. No decomposition of any pesticide was observed in any of the test solutions at room temperature or at elevated temperature (40°), nor was there spectroscopic evidence of any association between ascorbic acid and pesticide. Ascorbic acid disappeared from the solution, presumably because of the usual oxidation in non-deaerated solutions.

77-1340. Haseltine, S. D. (Ohio State Univ., Columbus, OH). **DDE-PTH interaction in eggshell production in mallards, pheasants, and king pigeons.** *Diss. Abstr. Int.* B 37(8): 3811B; 1977.

Female pheasants and king pigeons were placed on control and 10 ppm *p,p'*-DDE diets. Eggshell thickness, plasma calcium, tibia calcium, gut calcium uptake, plasma estrogens, eggshell structure, and response of plasma calcium and eggshell thickness to injection of 50 I.U. PTH/kg 12 hr before oviposition were compared in the 2 groups for each species. DDE-fed king pigeons produced eggshells 9.6 percent thinner than controls. They also exhibited depressed plasma and tibia calcium levels 4-6 hr before oviposition, but plasma estrogens and gut calcium uptake were unaffected. Eggshells from DDE-treated pigeons had thinner vertical crystal and spongy layers and fewer pores/unit area than eggshells from control pigeons. PTH elevated plasma calcium for 5 hr, but did not affect eggshell thickness in pigeons. Pheasants did not respond to dietary DDE treatment in eggshell thickness, plasma calcium, tibia calcium, or plasma estrogens. However, gut calcium uptake was depressed in DDE-treated pheasants ($p < 0.01$). Pheasant eggshell structure was affected by dietary DDE treatment only in the number of spicules present/unit area of the spongy layer ($p < 0.05$). PTH elevated plasma calcium for up to 5 hr after injection but did not affect eggshell thickness in pheasants. These results indicate that one site of action of DDE for producing eggshell thinning may be the bone, either during the buildup of calcium before shell calcification or during mobilization of calcium from long bones, and that intestinal transport of calcium is not a factor in the eggshell thinning response to DDT. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No.

77-1341. Peterson, C. A. (Oregon State Univ., Corvallis, OR). **The metabolic pathways and physiological effects of atrazine in Douglas-fir seedlings.** *Diss. Abstr. Int.* B37(9): 4244; 1977.

Herbicides are being used as a tool by forest managers to speed the restocking of sites where tree seedlings face competition from grasses for limited moisture, light and nutrients. A study investigated the physiological effects of atrazine on Douglas-fir [*Pseudotsuga menziesii* (Mirb.) Franco] seedlings and the metabolism of the herbicide by the young trees. The rates of photosynthesis were altered drastically by atrazine. Internal levels of atrazine ranged from 10 to 60 nmoles per gram dry needle weight. Respiration was not markedly affected by atrazine except when the photosynthetic rates were greatly altered. The investigation of metabolism showed that the partial resistance to atrazine attributed to Douglas-fir is most likely a result of the plant's ability to detoxify a portion of the herbicide taken up. The rate of metabolism was such that at the end of the 30 day experiment only three percent of the herbicide taken up by the plants was in the undegraded form. The plants appear to detoxify atrazine by hydroxylation and peptide conjugation of the parent compound. Atrazine appeared to have contrary effects on the seedlings at different concentrations. At low concentration it acts as a growth promoting substance which exhibits cytokinin-like properties. At elevated concentrations it is a potent inhibitor of photosynthesis. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 77-6080).

77-1342. Soderlund, D. M. (Univ. California, Berkeley, CA). **Structure-biodegradability relationships in pyrethroid insecticides.** *Diss. Abstr. Int.* B 37(9): 4311-4312; 1977.

This investigation examines the biodegradation rates of 66 pyrethroids and related compounds in one or both of the mouse liver microsomal mfo and esterase systems. Studies with deuterium and ^{18}oxygen investigate the mechanism of the mfo reactions and selective inhibition and solubilization experiments clarify the nature of the observed esterase activity. The oxidase rates for pyrethroids and related compounds in the mfo system are influenced more by the nature of the substituents present than by the configuration of the acid moiety and α-substitution in the alcohol portion; an exception is α-cyano substitution in the alcohol, which greatly reduces oxidase

rates relative to unsubstituted compounds. Heavy isotope studies demonstrate that [1R, *trans*]-permethrin is preferentially oxidized at the 2-*cis*-methyl group; this preference is not seen in other permethrin isomers or in chrysanthemates but it may occur generally with dihalovinyl-substituted [1R, *trans*]-cyclopropanecarboxylates in the mouse mfo system. The oxidase plus esterase rate corresponds to the sum of the separately-determined oxidase and esterase rates. With primary alcohol *Trans*-esters, hydrolysis generally proceeds more rapidly than oxidation so that their overall metabolism rates closely correspond to their hydrolysis rates. Solubilization and purification experiments indicate that two esterases or esterase localizations are involved in pyrethroid hydrolysis; these activities can be solubilized by repeated homogenization and centrifugation or by digestion of the microsomes with phospholipase-A. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms. Order No. 77-4606.)

77-1343. Wenz, J. M. (Univ. California, Berkeley, CA). **Implications of wildfire and pesticide application on forest soil microarthropod populations in northeastern California.** *Diss. Abstr. Int.* B 37(9): 4312-4313; 1977.

Insecticides and wildfire were investigated for three years for their effects on soil microarthropods under *Pinus ponderosa* in Modoc Co., California. Insecticide treatments by hand were: DDT (chlorinated hydrocarbon) In addition one plot treated with DDT at 4.1 kg/hectare by helicopter was evaluated. DDT caused decreases of predaceous Mesostigmata and Prostigamata (Bdellidae) and concurrent increases of Coleembola (Poduroidea and Entomobryoidea). Specific mesostigmatids affected were *Zercon* sp. (Zerconidae) and *Ambylseius inornatus* (Phytoseiidae). Effects on other groups, including the Cryptostigmata, were variable. The aerially applied DDT was inferred to have similar effects. Effects were still evident at the end of the study, 26 months after treatment, implying that extended evaluation is necessary to adequately monitor potential side effects of control operations. There were no significant differences in effect between application rates. Both parathion and carbaryl caused reductions of Collembola, Mesostigmata, Prostigmata and Cryptostigmata. Effects were still evident 10 months after the first treatment and the second application caused additional reductions of certain groups. Two groups evaluated; effects were still evident two and three years after the fires occurred. One group, the Nanorchestidae (Prostigmata) increased in the burned plots one and two years after burning. Results from all treatments indicate that evaluation should not be confined to large composite taxonomic groupings as effects on specific groups can be masked. Disruptions of soil microarthropods have potential long-term consequences to decomposition and nutrient cycling processes and should be weighed carefully when considering forest management options. (Author abstract by permission. Copies of the thesis are available from University Microfilms. Order No. 77-4647).

77-1344. Beck, S. L. (Dep. Biol., Wheaton Coll., Norton, MA 02766). **Postnatal detection of prenatal exposure to herbicides in mice, using normally occurring variations in skeletal development.** *Teratology* 15(2): 15A; 1977.

Four groups of CD-1 mice were treated between days 6-15 of gestation via intragastric maternal intubation of 3.3 ml corn oil/kg body weight containing (1) trifluralin at 1.0 kg (TFL), (2) 2,4,5-T at 100 mg/kg (245T-H) - a reported teratogenic dose, (3) 2,4,5-T at 20 mg/kg (245T-L) - a reported no-effect dose, or (4) the vehicle alone (VEH). A fifth group was untreated (UNTD). Litters were born in isolation, examined perinatally and at weaning, and killed at 62+2 days. Specimens were processed by the alizarin method for examination of more than 40 normally occurring variations in skeltal development. Disarticulated skeletons were than prepared by the papain method and examined for a second battery of more than 30 variants. More than 90 specimens from at least 10 litters were examined in each group. Fifty-eight characters showed variation. Differences from UNTD ($t > 2.6$, $P > .01$, on arcsin-square root transformed frequencies) occurred as follows: 245T-H (positive control) = 14, VEH = 5, 245T-L (negative control) = 5, TFL = 7. Average differences among significant traits were: TFL = 21+3%, 245T-H = 19+3%, 245T-l = 15+.7%, VEH = 10+2%. Both 245T-H and TFL showed clustering of variants and a few dramatic differences in frequency. Both compounds could be detected based on number, magnitude, and spectrum of differences from UNTD. (Author abstract by permission)

77-1345. Mele, J. M.; Jensh, R. P. (Dep. Anat., Thomas Jefferson Univ., Philadelphia, PA). **Teratogenic effects of orally administered tri-*o*-cresyl phosphate on Wistar albino rats.** *Teratology* 15(2): 32A; 1977.

Pregnant rats were treated with 750 mg/kg or 500 mg/kg of tri-*o*-cresyl phosphate (TOCP) on the 18th and 19th days of gestation. Previous studies involving postnatal behavior effects due to prenatal treatment resulted in a decreased litter size in rats treated with the higher dosage level. Additionally, single dosage levels of 1500 mg/kg were embryotoxic. The pregnant rats were divided into 2 experimental groups (750 mg/kg and 500 mg/kg TOCP) and one control group (corn oil). The treatment was administered orally by intubation. All animals were sacrificed on the 22nd day of gestation. The fetuses were removed, examined and weighed after recording position and resorptions. All fetuses were fixed in Bouin's fixative and dissected using Wilson's technique. There were no significant differences noted among the experimental and control groups for the following parameters: embryonic or fetal death rate, fetal and placental weights, litter size and abnormality rate. These data are preliminary to studies concerning the effects of prenatal treatment with TOCP upon postnatal behavior. (Author abstract by permission)

77-1346. Konyukhov, A. F.; Kokhtiuk, F. P. (All-Union Inst. Exp. Vet. Med., USSR). **Diagnostika ostrykh otrav-**

lenii zhivotnykh amifosom. [Diagnosis of acute amiphos poisoning in animals.] *Veterinariya* 8: 101-102; 1976. (Russian)

Symptoms of acute poisoning by amiphos and residues of this substance in different organs of chickens and sheep were studied. Functional disturbances in the central and sympathetic nervous systems (depression, muscular weakness, miosis, heavy breathing, tremors of the head, and signs of asphyxia) were the symptoms of acute poisoning. The considerable reduction of the blood acetylcholinesterase activity (by 60-90%) was also of diagnostic value. The acetylcholinesterase activity returned to normal in 20 days. Diagnosis requires the determination of amiphos residues in gastric contents, liver, kidney, and brain. After acute poisoning, chickens and sheep can be slaughtered for meat after 15 and 20 days, respectively. Meat containing amiphos residues is not permitted for consumption.

77-1347. Shulyak, V. D.; Malinin, O. A.; Trifonova, T. K.; Zaitseva, L. D. (Ukr. Sci. Res. Inst. Exp. Vet. Med., USSR). **Toksikologicheskaia kharakteristika dilora. [Toxicologic characteristics of dilor.]** *Veterinariya* (7): 100-101; 1976. (Russian)

The acute and chronic toxicity of dilor, a possible replacement for DDT, was studied in animals. Single oral doses of 3.000-8.000 mg/kg caused no pronounced typical poisoning symptoms in rats. Leukocytopenia, increased phagocytic activity of the leukocytes, and increased pyruvic acid level in the blood were observed in sheep fed 2 mg/kg doses 5 days a week for 3 months. Twenty days after termination of the chronic poisoning the residue levels were 0.01-0.06 mg/kg in tissues and, 0.33 mg/kg in fat; the latter contained 0.08 mg/kg after 3 months. Dilor had no influence on the estrous cycle. Female rats treated with daily 100 mg/kg doses during the first 10 days after insemination and sacrificed on the 20th day showed a fertility rate of 66.6% against 80% in the control. The reduction is due to the general toxic effect of dilor and to its direct effect on the fetuses. Analyses of blood samples from pregnant rats showed reductions indicate the low toxicity of dilor, which may, however, persist for a long time in adipose tissues.

77-1348. Abbasov, T. G. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Toksichnost' fosfamida i metilnitrofosa dlya kur. [Toxicity of dimethoate and fenitrothion to chickens.]** *Veterinariya* 8: 104-105; 1976. (Russian)

The acute oral toxicity of dimethoate and fenitrothion was studied in chickens. The LD16 values were found to be 35 mg/kg for dimethoate and 430 mg/kg, and the LD16 doses are 62 mg/kg and 550 mg/kg, respectively. Motor dyscoordination, tremor, fibrillation of the muscles of the neck, tic-like movements of the head, heavy breathing, rales, and discharge from the buccal cavity are the principal symptoms of poisoning. Dose-dependent inhibition of the cholinesterase activity was observed. The animals poisoned with dimethoate died with cholinesterase inhibition rates of 69-86%. Inhibition of the cholinesterase activity by 80-86% was lethal in fenitrothion-poisoned chickens.

77-1349. Trifonova, T. K. (UNIIL'V, USSR). **Dilor i fentiuram i vosproizvoditel'naia funktsiia zhivotnykh. [Dilor and fentiuram effects on reproductive function of animals.]** *Veterinariya* 12: 67-69; 1976. (Russian)

The effect of orally administered dilor and fentiuram on the repoductive function of female albino rats was studied. Dilor, administered to female rats in a dose of 2% or 1% LD50 during the first 10 days after insemination, had embryotoxic effects, causing miscarriage, fetal death, and resorption. Fentiuram, administered in a dose of 4% LD50 during the first 10 days of pregnancy, had only a weak embryotoxic effect. The embryotoxic effect of fenthiuram was more pronounced in rats that had been treated for 4 months prior to insemination. The findings indicate that dilor and fenthiuram residues in feed, foodstuffs, and other environmental media represent a potential hazard to man and animals.

77-1350. King, M. E.; Roesler, A. R. (Life Sc. Div., IIT Res. Inst., Chicago, IL). **Subacute intubation study on rats with the compound 2,3,7,8-tetrachlorodibenzo-*p*-dioxin.** *Natl. Tech. Inform. Serv.* PB-257,677, 1974, 60 p.

The report describes a 12-month study to determine the effects of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD), an extremely toxic contaminant of the herbicide 2,4,5-T. Male and female rats were intubated twice weekly to provide 0, 0.1 or 1.0 μg/kg/wk of TCDD dissolved in acetone diluted with corn oil. The animals were treated for a total of 28 weeks and held for an additional 12-week recovery period. Body weight observations were made weekly throughout the entire test period. Groups of rats were killed at the end of 2, 4, 8, 16 and 28 weeks of treatment and after 4 and 12 weeks recovery. TCDD was observed to be toxic but not lethal to rats. The extent of the toxic effects, which were manifested by centrilobular fatty change and increased hepatocellular turnover, were confined to the liver and were more severe in male than in female rats. (Author abstract by permission)

77-1351. Adelman, I. R.; Smith, L. L., Jr. (Dep. Entomol. Fish. Wildl., Minnesota Univ., St. Paul, MN). **Standard test fish development. Part II. Chronic toxicity of guthion to the fathead minnow (*Pimephales promelas* Rafinesque).** *Natl. Tech. Inform. Serv.* PB-257-785, 1976, 31 p.

Three chronic bioassays of Guthion (azinphosmethyl) were conducted with fathead minnows. All tests were begun with eggs, and the longest lasted 20 days after termination of spawning, a total of 250 days. Parameters measured were survival, growth, fecundity, and growth and survival of second generation fry and eggs. The most

sensitive criteria for effect of the toxicant was fecundity. The maximum acceptable toxicant concentration was between 0.33 and 0.51 microgram/liter Guthion and the application factor between .00017 and .00027. (Author abstract by permission)

77-1352. Spacie, A. (Natl. Water Qual. Lab., Duluth, MN). **Acute and chronic parathion toxicity to fish and invertebrates.** *Natl. Tech. Inform. Serv.* PB-257,800, 1976, 109 p.

The research demonstrates that parathion is highly toxic to aquatic species, may accumulate in tissues, and may persist long enough to cause chronic damage. To find ecologically 'safe' levels allowable in aquatic systems, the long-term effects of parathion must be studied further. The objective of the present study was to find the greatest chronic levels of parathion that produce no harmful effects to brook trout, bluegills, fathead minnows, *Daphnia magna*, *Gammarus fasciatus*, and *Chironomus tentans*. For each species, the maximum acceptable toxicant concentration (MATC), defined by Mount and Stephan, was then related to the acute LC50. Because standardized bioassay techniques were used, the results of these tests may be correlated with those for other species and compounds. (Author abstract by permission)

77-1353. Crockett, P. W. (Natl. Tech. Inform. Serv., Springfield, VA). **Toxicity of pesticides (a bibliography with abstracts).** *Natl. Tech. Inform. Serv.* PB-76/037/7ST, 1976, 266 p.

Research reports on the toxic effects of pesticides on non-target organisms are cited. Included are studies on the biological effects on humans, wildlife, and aquatic life through direct exposure, food chains or degradation products. Special emphasis is given to research on the inhibition of cholinesterase and other enzymes. This updated bibliography contains 261 abstracts, 73 of which are new entries to the previous edition. (Author abstract by permission)

77-1354. Kurtz, P. J. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, Aberdeen, MD). **Behavioral and biochemical effects of malathion.** *Natl. Tech. Inform. Serv.* AD-A030,248, 1976, 17 p.

Rat conditioned avoidance performance and spontaneous motor activity were examined after intraperitoneal injection with 25, 50, 100 or 150 mg/kg of the organophosphate insecticide, malathion. The effects of these dosages on plasma were assessed. Avoidance performance was significantly impaired 1 hour after injection with 50 mg/kg although blood and brain cholinesterase activity remained at greater than 90 percent of control values. The higher dosages (100 and 150 mg/kg) produced significant decreases in blood and brain cholinesterase activity as well as avoidance performance. Spontaneous motor activity was not significantly changed at any dosage. The results suggest that low dosages of malathion may disrupt behavior without significantly reducing cholinesterase activity. (Author abstract by permission)

77-1355. Ehwald, E. (Author address not given). **Bodenkundliche Probleme in Umweltnuztung, Umweltgestalung und Umweltschutz. [Soil Problems in environmental exploitation, design, and protection.]** *Sitzungsber. Akad. Wiss DDR, Mathematik - Naturwissenschaften - Technik* (12): 5-29; 1975. (103 references) (German)

General environmental and ecological problems of soil are reviewed. Adsorption of biocides on soil particles may retard or accelerate their degradation, and decreases or increase their activity. Certain pesticides can form toxic and possibly carcinogenic metabolites in the soil. The herbicidal phenylanilides metabolizes to anilines, which may form azo compounds. While most pesticides have no deleterious effect on soil microflora, they may impair the soil structure by killing rainworms.

See also **77-1180** **77-1181** **77-1193**

77-1356. Safe, S.; Hutzinger, O.; Crocker, J. F. S.; Digout, S. C. (Guelph Waterloo Cent. Grad. Work Chem., Guelph Campus, Guelph, Ontario, Canada). **Identification of toxic impurities in commercial diphenylamine.** *Bull. Environ. Contam. Toxicol.* 17(2): 204-207; 1977. (6 references)

Crude diphenylamine (DPA) was cleaned up and the resulting nonpolar DPA-free fraction was analyzed by flame ionization gas chromatography. The nonpolar DPA impurities were further purified by separation and isolation on silica gel. The purified isolates were studied using gas chromatogrphy, mass spectrometry, infrared spectrometry, and nuclear magnetic resonance. TlC bands 3 and 5 were identified as the *O*-cyclohexylaniline and *p*-cyclohexylaniline structures, and bands 2 and 4 were identified as *o*-biphenylamine and *p*-biphenylamine, respectively. The structure of band 1 was not precisely determined, but the structure of an ortho-substituted aniline was suggested. Six commercial brands of DPA were analyzed for these impurities. *O*-Cyclohexylaniline was detected in all samples; band 1 and *p*-biphenylamine, a known carcinogen, were detected in four; *o*-biphenylamine was detected in three; and *p*-cyclohexylaniline was detected in one. Studies in pregnant rats showed that several of the impurities induced a type of polycystic kidney disease previously associated with crude commercial DPA.

77-1357. Begmatova, M. P. (Central Asian Sci. Res. Proj. Inst. Food Ind., USSR). **Opredelenie ostatochnykh kolichestv khlorata magniia v semenakh khlopchatnika, ikh shelukhe i khlopkovom shorte. [Determination of magnesium chlorate residues in cotton seeds, cotton-seed hulls, and cotton-seed oil cake.]** *Khim. Sel. Khoz.* 14(8): 66-67; 1976. (6 references) (Russian)

A thin-layer chromatographic method for the determination of magnesium chlorate, used for defoliation in combination with butylkaptax, in cotton seeds, cotton-seed hulls, and cotton-seed oil cake is described. Following extraction with acetone, determination is done on an alumina plate, using acetone/*n*-butanol/ammonia/water (65:20:10:5) as a solvent system, and a 5% solution of benzidine in 2 *n*-hydrochloric acid as a visualizing agent. The plate is finally treated with concentrated sulfuric acid. Magnesium chlorate appears in the form of yellow spots against a white background. The sensitivity of the method amounts to 0.1 mg/kg in cotton-seeds and cotton-seed shells, and 0.3 mg/kg in oil cake.

77-1358. Babkina, E. I.; Bobovnikova, Ts. I.; Mironiuk, G. V.; Dibtseva, A. V. (Institute of Experimental Meteorology, USSR). **Opredelenie khlororganicheskikh pestitsidov i ikh metabolitov v pochve raznykh tipov. [Determination of organochlorine pesticides and their metabolites in various types of soils.]** *Khim. Sel. Khoz.* 14(8): 68-70; 1976. (5 references) (Russian)

A method for the extraction and gas-chromatographic determination of organochlorine pesticides and their metabolites from different types of soils is described. The soil sample to be analyzed is combined with distilled water at a ratio of 1:2, and extraction is performed with a 4:1 mixture of *n*-hexane with acetone. (The recovery rate was low when extraction was done with *n*-hexane and acetone alone.) Separation, identification and quantitative determination are done on a gas chromatograph with polar and nonpolar phases and with electron capture detector. It is thus possible to separate hexachlorobenzene (HCB) and BHC, *o,p'*-DDT and *p,p'*-DDD, as well as α-BHC and aldrin. The sensitivity of the method amounts to 0.0005-0.001 mg/kg for hexachlorobenzene, α-BHC and lindane, and 0.002-0.007 mg/kg for DDT and its metabolites. The recovery rates of the various pesticides were found to be 64.8-110% for meadow podzol, 54-90.4% for sierozem (gray desert soil), 43.3-100% for chestnut brown soil, 28-84% for chernozem, and 54.7-87.7% for alluvial soil. The recovery rates were lowest for hexachlorobenzene, highest for *o,p'*-DDT, *p,p'*-DDD (TDE) and *p,p'*-DDT.

77-1359. Vrochinskii, K. K.; Perlovskaya, E. D.; Platonova, M. T. (Kirgiz Sci. Res. Inst. Epidemiol., Microbiol., Hyg., USSR). **Opredelenie fenurona v pochve, vode i rasteniiakh metodom tonkosloinoi khromatografii. [TLC determination of fenuron in soil, water, and plants.]** *Khim. Sel. Khoz.* 14(8): 70-72; 1976. (3 references) (Russian)

A thin-layer chromatographic method for the determination of fenuron in soil, water, and plants is described, and results of fenuron residue analyses in these media are reported. After threefold extraction with chloroform, determination is done on an alumina plate, with sodium nitrite and α-naphthol for visualization. Fenuron appears in the form of orange-red spots. Systematic residue analyses performed in Uzbekistan revealed that fenuron persisted in soil for over 1 yr and in water for up to 1 yr. The cumulation factors are 0.23-0.33 in fish, 1-3 in mud, 6.4 in rush, and 9.1 in algae.

77-1360. Korzhevenko, G. N.; Leshchev, V. V.; Metelev, V. V.; Brichko, V. F. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Uskorennyi metod diagnostiki otravlenii ryb fosfororganicheskimi pestitsidami. [Rapid method of diagnosing organophosphate poisoning in fish.]** *Veterinariya* (9): 90-92; 1976. (Russian)

An enzyme chromatographic method for the rapid routine detection and determination of organophosphorus pesticides in water and fish is described. After extraction with chloroform from water, and with acetone from fish, the extract is purified, and the thione phosphates are activated in hydrogen peroxide vapor. Organophosphorus pesticides as a group are visualized on chromatographic paper imbibed with a mixture of bromthymol blue and acetylcholinesterase. The sensitivity of the method amounts to 0.02 mg/kg in fish and to 0.002 mg/l in water for

baytex (fenthion), DDVP (dichlorvos), phoxim, diazinon, trolen (ronnel), TCM-3, phosalone, and ciodrin; to 0.04 mg/kg in fish and 0.004 mg/l in water for methylnitrophos (fenitrothion), and to 0.1 mg/kg in fish and 0.01 mg/l in water for dursban (chlorpyrifos), carbophos (malathion), metaphos (methyl parathion), trichlorfon, and phthalophos (phosmet).

77-1361. Petukhov, R. D. (All-Union Inst. Exper. Vet. Med., USSR). **Opredelenie antio i fosfamida v mede. [Determination of formothion and phosphamide in honey.]** *Veterinariya* (7): 101-102; 1976. (Russian)

A thin-layer chromatographic method for the determination of formothion and phosphamide (dimethoate) in honey is described. The residues are extracted twice from honey with *n*-hexane, after which beeswax and pigments are separated. Determination is done on a silica gel layer, using a 1:2 mixture of acetone and *n*-hexane as the solvent system, and acetone solutions of bromphenol blue and silver nitrate for visualization. The plates are sprayed with citric acid for fixation. The sensitivity of the method amounts to 0.1 mg/kg/.

77-1362. Koniukhov, A. F. (All-Union Inst. Exper. Vet. Sci., USSR). **Analiz ftalofosa v patologicheskom materiale i kormakh. ∫ [Analysis of phthalophos (phosmet) in pathological materials and feed.]** *Veterinariya* (11): 104-105; 1976. (Russian)

A thin-layer chromatographic method for the determination of phthalophos in pathological materials, feed, and plant materials is described. After extraction with acetone, coextracted impurities are eliminated by reextraction with water and chloroform, and the final specimen in acetone is applied to a silica gel layer, using a 2:1 mixture of hexane and acetone as solvent system. Bromphenol blue in acetone and an aqueous solution of silver nitrate are used for visualization. After the plate is sprayed with acetic acid solution, phthalophos appears in the form of dark blue spots against a yellowish background. The *Rf* value is 0.52±0.03. The sensitivity of the method is 0.3 mg/kg at a recovery rate of 88±11%.

77-1363. Biryukova, N. P.; Moryakov, Yu. F.; Nepoklonov, A. A. (All-Union Sci. Res. Inst. Vet. Hyg., USSR). **Opredelenie ostatochnykh kolichestv difosa. [Determination of dyfos residues.]** *Veterinariya* (11): 103-104; 1976. (Russian)

A thin-layer chromatographic method for the determination of dyfos (abate, temephos) in water, milk, and animal tissues is described. After extraction with acetone and transfer into chloroform, determination is done on a silica gel plate, using *n*-hexane/acetone (5:1) and *n*-hexane/ethyl acetate (3:1) as solvent systems. Bromphenol blue and silver nitrate in acetone are used for visualization, and acetic acid is used for fixation. The sensitivity of the method amounts to 1 μg per sample.

77-1364. Hennings, P.; Gohmann, P.; Otterpohl, G. (VEB Fahlberg-List, Forschungszentr. Pflanzensch. Schaedlingsbekaempfungsmittel, Magdeburg, East Germany). **Zur Reaktion von 1,4-Oxathienen mit Jodwasserstoffsaeure und ihre Anwendung zur Bestimmung des Fungizids Carboxin. [Reaction of 1,4-oxathienes with hydriodic acid and its use for determining carboxin.]** *Z. Chem.* 16(11): 448-449; 1976. (2 references) (German)

The reaction of 1,4-oxathienes, including carboxin, with hydriodic acid was studied with respect to the utilization of this reaction for the determination of carboxin. Liberation of an equivalent quantity of iodine was observed in strongly acid, aqueous organic media in the presence of excess iodine ions. The cleavage of the C-S bond was due to the strongly polarizable iodine ions; this bond was stable in neutral and basic media. The iodine liberated can be titrated with sodium thiosulfate, which can be used for the determination of carboxin.

77-1365. Greenberg, R.; Resnick, C. (Plant Protect. Dep., Min. Agric., Jaffa, Israel). **A gas-liquid chromatographic method for determining imazalil residues in citrus fruit.** *Pestic. Sci.* 8(1): 59-64; 1977. (4 references)

An electron capture gas-liquid chromatographic method is described for the analysis of the fungicide imazalil, 1-(β-allyloxy- 2,4-dichlorophenethyl) imidazole, in citrus fruit. Recoveries were 80-95% from citrus fortified at 0.50-2.0 mg/kg, with a limit of detection of 0.01 mg/kg. (Author abstract by permission)

77-1366. Federal Working Group on Pest Management (Rockville, MD). **Guidelines on analytical methodology for pesticide residue monitoring.** *Natl. Tech. Inform. Serv.* PB-257,635, 1975. 62 p.

Topics covered include: safety; sampling; storage of samples; solvents and reagents; extraction (subsampling and preparation, extraction efficiency); cleanup (cleanup procedures, concentration of solutions, automated cleanup); detection and quantitation (gas chroamtography, other methods); confirmation of residue identity; sensitivity and limit of detection; losses and degradation of pesticides; statistical evaluation and reporting results (accuracy, precision, multiple injections, collaborative studies, reporting results); metabolites and degradation products; multicomponent pesticides and PCB's; reference standards; and manuals and general references. (Author abstract by permission)

77-1367. Stalling, D. L.; Huckings, J. N. (Fish-Pestic. Res. Lab., Fish Wildl. Serv., Columbia, MO). **Analysis and GC-MS characterization of toxaphene in fish and water.** *Natl. Tech. Inform. Serv.* PB-257,773, 1976. 53 p.

Sensitive methods for the detection and identification of toxaphene in water and fish are described. Polyurethane foam, gel permeation and silicic acid chromatography were used to permit accurate quantita-

tion of multi-component toxaphene residues. A method for characterization of changes in isomer composition of toxaphene residues in fish was reported. A brief description of PCB-toxaphene separation is given. The chemical composition of toxaphene was examined by electron impact and chemical ionization mass spectrometry. Chemical ionization gas chromatography-mass spectrometry was particularly applicable to the analysis and confirmation of toxaphene in residues in environmental samples. (Author abstract by permission)

77-1368. Olds, K. L. (Army Environ. Hyg. Ag., Aberdeen Proving Grounds, Aberdeen, MD). **Pesticide monitoring guidelines, scheduled monitoring (effective 1 April 1976).** *Natl. Tech. Inform. Serv.* AD-A029.983, 1976, 29 p.

The necessity of and mechanisms for stratification of environmental sampling are presented. This serves as the major basis for revision of the Department of the Army Pesticide Monitoring Program. The revised program further insures reliable monitoring data to support pesticide and pest management program changes. (Author abstract by permission)

77-1369. Vinopal, J. H.; Suprock, J. F. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, Aberdeen, MD). **Pesticide recovery studies for evaluation for pest management and pesticide monitoring division water analysis methodology, June 1974 - June 1976.** *Natl. Tech. Inform. Serv.* AD-A030.003, 1976, 18 p.

This is a final report describing percent recovery studies carried out using 10 representative pesticides for the validation of the environmental surface water analysis method used in the Department of the Army (DA) Pesticide Monitoring Program. In addition, this report presents lower limits on instrumental sensitivity for the 26 pesticides on the DA Pesticide Monitoring Program routine monitoring list. Third, this report presents data comparing automatic integration (Auto Lab System IV Computing Integrator) and manual (peak height measurement) quantitation techniques. (Author abstract by permission)

77-1370. Olds, K. L. (Army Environ. Hyg. Ag., Aberdeen Proving Ground, Aberdeen, MD). **Evaluation of linear electron capture detector, May 1976.** *Natl. Tech. Inform. Serv.* AD-A030.980, 1976, 18 p.

An Analog Technology Corporation (ATC) Wide Range Electron Capture Detector and Electrometer were evaluated for a linear response to various concentrations of representative pesticides. The ATC detector showed a very linear response to the representative pesticides but negative peaks were observed in actual environmental samples which were not observed with other detectors in use by the Pesticide Monitoring Branch. (Author abstract by permission)

See also **77-1180** **77-1181** **77-1221** **77-1269**

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc).

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